SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyright, 1895, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXIII.—No. 2. ESTABLISHED 1845. NEW YORK, JULY 13, 1895 [$3.00 A YEAR. WEEKLY.

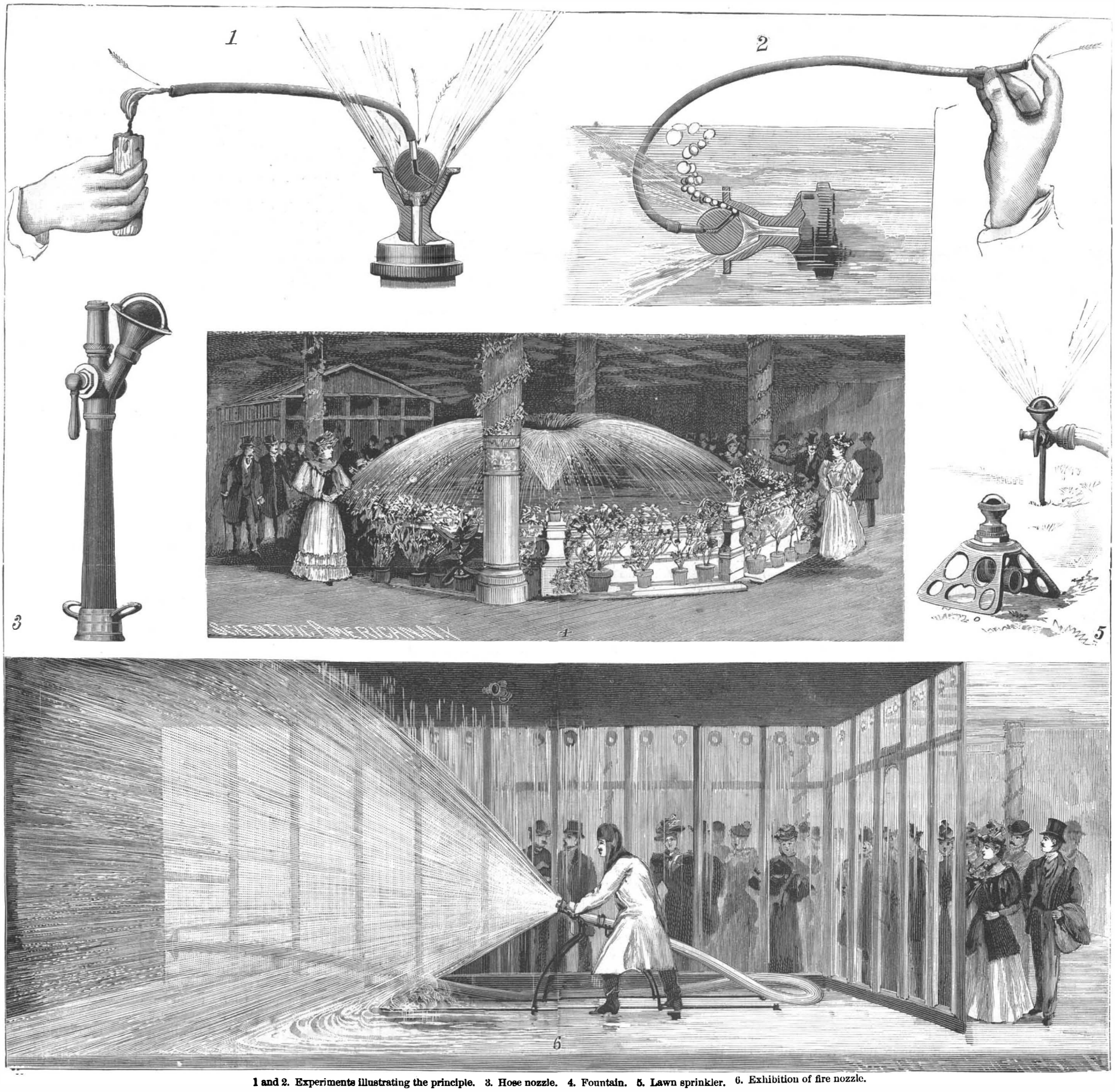
THE BALL NOZZLE.

One of the most attractive exhibits for purely commercial purposes to be seen in this city is that of the American Ball Nozzle Company, at 837-847 Broadway. The attention of the passer-by is attracted by the rich floral decorations and fountains, and by the ever-interested throng which enters the place. The visitor will soon learn that the whole affair is a grand method of advertising a contrivance which, although exceedingly simple, is a mystery to the great majority of spectators. The first object shown is a cup-shaped nozzle in which is placed a ball of light material; and although the ball in this particular exhibit is not confined in any way, it is found impossible to blow it from the cup-shaped nozzle.

The why and the wherefore of this phenomenon are not explained by the exhibitor, and he intimates that no one has explained it, or can do so. We think, however, the reader will be able to understand the phenomenon before we have done with our explanation. Be this as it may, the device is ingenious and effective. The cup-shaped nozzle with the ball in it, as shown in the engraving, and a wire guard for preventing the accidental escape of the ball, constitute the invention. This nozzle throws a fine cone of spray, whether used as a fire nozzle, as in Figs. 3 and 6, as a fountain, as in Fig. 4, or as a lawn sprinkler, as shown in Fig. 5. While in operation in either of these capacities, the ball moves rapidly with a gyratory motion, and causes the water to escape in the form of a large cone of spray. In fire extinguishing this is very effective, as the volume of water is enormous and the area covered very large. It serves as a protection to the fireman, and thus enables him to approach near the fire. It is very efficient in the protection of property adjoining the fire. For interior fires, especially those in cellars, ships' holds and similar situations, it has an undoubted advantage.

It has still another application, peculiar to itself, that is the protection of lumber yards and areas containing quantities of combustible material. By the use of stand pipes provided at the top with ball nozzles a radius of 100 feet for each stand pipe and nozzle will be covered. It will thus be seen that a large yard may easily be protected from fire brands and flying sparks and cinders by a few such nozzles. As a lawn sprinkler the advantages of the ball nozzle are obvious.

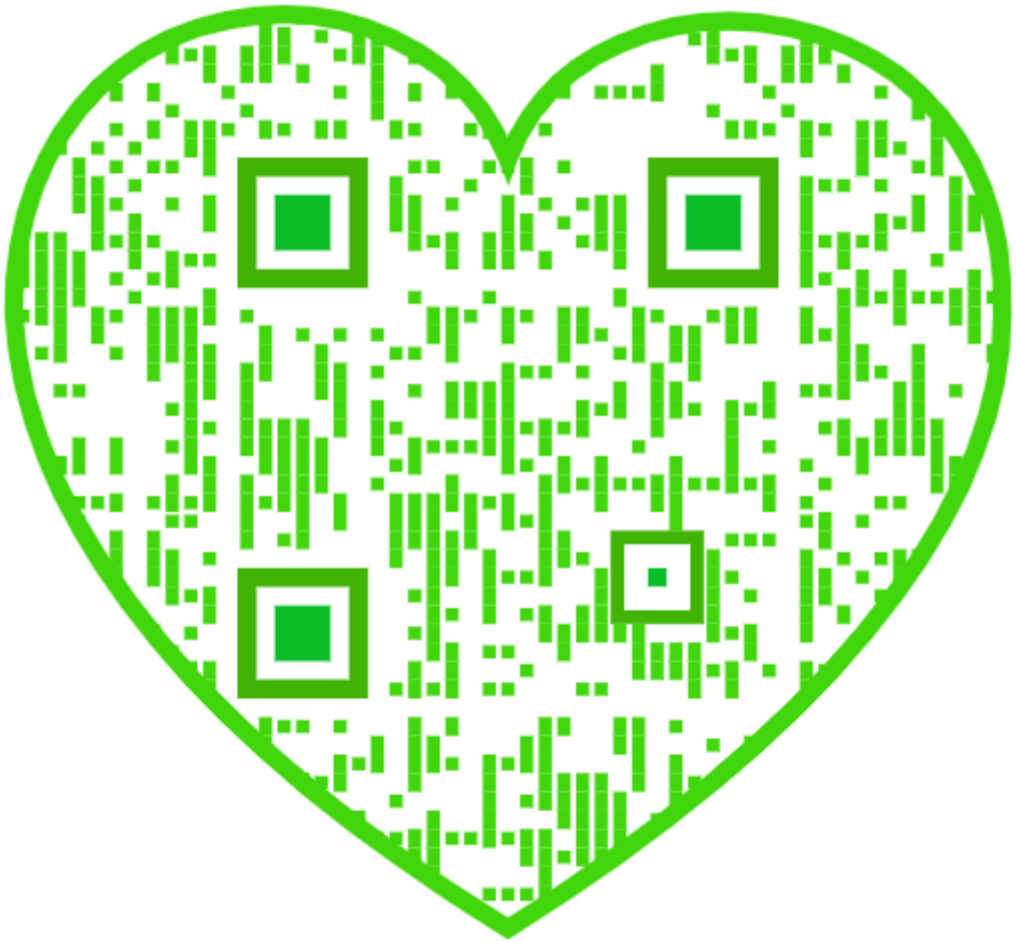
There is in the exhibit to which reference is made a large watertight room with three glass sides, through which spectators may look, and at intervals the exhibitor enters, turns on the water and causes it to pass through the plain nozzle; then, to show the difference between the effect of the plain jet and the same quantity of water passed through the ball nozzle,



1 and 2. Experiments illustrating the principle. 3. Hose nozzle. 4. Fountain. 5. Lawn sprinkler. 6. Exhibition of fire nozzle.

THE BALL NOZZLE.

© 1895 SCIENTIFIC AMERICAN, INC.



he immediately turns the water from the plain nozzle to the ball nozzle, and a surprising effect is produced. The entire room is filled with spray, and it is impressively shown how small would be the chances for fire in such a room. The nozzles are made double as shown in Fig. 3, to permit of throwing either a solid or spray jet, the passage of the water to either one or the other of the branches of the nozzle being controlled by the threeway valve. The lawn sprinkler is either mounted on a stand or a short spike as shown in Fig. 5.

The explanation of the phenomenon of the ball nozzle is as follows: The water issuing at the sides of the ball produces a zone of vacuum, where the water is tangent to the ball, on the principle of the ejector. Air pressure upon the outer surface of the ball tends to force it into this vacuum zone, and as the area of the ball covered by the vacuum is many times larger than the aperture through which the water escapes to the cup of the nozzle, the total air pressure on the ball is greater than any water pressure that would be likely to be exerted upon the ball; but as the air pressure is limited to a little less than fifteen pounds per square inch, we can conceive that there might be a water pressure which could no longer be opposed by the air pressure, and as a consequence the ball would be blown out of the cup.

To prove that a vacuum is formed at the zone where the water is tangent to the ball, we have caused a ball to be perforated, as shown in Figs. 1 and 2, and have proved that a vacuum exists at the zone of tangency, by connecting a tube with the perforation, and holding a candle at the mouth of the tube, as shown in Fig. 1. The drawing of the candle flame into the tube shows that air is rushing in to supply the vacuum produced by the escaping water.

In Fig. 2 the parts are placed in similar relation to each other, but the ball nozzle is submerged. In this case the outrush of the water produces a vacuum as before and the air rushing in to satisfy the vacuum escapes in bubbles through the water. When the tube is closed by the finger, thus preventing the air from passing to the nozzle, the bubbles cease.* These explanations and experiments indicate the nature of the phenomenon of the ball nozzle.

The American Ball Nozzle Company will make an attractive exhibition at the Atlanta Exposition, and will furnish the fire protection and several of the fountains.

The Wood of Most Uses.

Theoretically speaking, says Timber, of London, Eng., the oak is the wood which can be put to the greatest variety of uses, but, as a matter of fact, the pine is most used, on account of its abundance. The timber of the oak, which combines in itself the essential elements of strength and durability, hardness and elasticity in a degree which no other tree can boast, has been used as a material for shipbuilding since the time of King Alfred. It is also employed in architecture, cabinetmaking, corving, mill work, coopering, and a thousand and one other ways, while the bark is of great value as furnishing tan and yielding a bitter extract in continual demand for medicinal purposes.

The timber of the pine is also used in house and ship carpentry. Common turpentine is extracted from it, and much tar, pitch, resin and lampblack. Splinters of the resinous roots serve the Highlanders instead of candles. Fishermen make ropes of the inner bark which the Kamchatdales and Laplanders steep in water and utilize for making a coarse kind of bread. The oil obtained from the shoots of the dwarf pine is a kind of universal medicine among the peasants of Hungary, while the soft grained silver fir is in much requisition for the sounding boards of musical instruments, and the Germans employ it almost exclusively in their vast toy factories. In the manufacture of lucifer matches, and, above all, paper pulp, thousands and tens of thousands of acres of pine forests are cut down every year, and the timber, constituting the chief material of English and American builders, is more used than all other kinds of wood put together.

Ruwenzori.

Mr Scott Elliott has been investigating the botany of Ruwenzori, the giant mountain of Central Africa. Up to 7,000 feet he found grass and cultivation; then begins the forest, which up to 8,600 feet consists of deciduous trees, sometimes with thick undergrowth, sometimes quite open, with a profusion of ferns, mosses, and creepers. From 8,600 to 9,600 feet bamboos grow, and the predominant feature is the wetness of everything. Only very watery plants grow among the roots. Above 9,600 feet tree heather takes the place of bamboo, and seems to extend to the snow, which Mr. Elliott could not reach, and even beyond. In one attempt to reach the summit he found what seems to him the Alpine lady's mantle. On the mountain birds and animals are extremely scarce. He saw a sun bird, green, yellow, and crimson, above 10,000 feet, and also saw a robin and a goldfinch.

* For an account of interesting experiments with the ball nozzle the reader is referred to SUPPLEMENTS 37, 47 and 51.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year.*

Building Edition of Scientific American.

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Export Edition of the Scientific American,

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, post paid to any part of the world. Single copies 25 cents.

☞ Manufacturers and others who desire to secure foreign trade, may have large and handsomely displayed announcements published in this edition at a very moderate cost. MUNN & CO., Publishers, 361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, JULY 13, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

Arid West, future of the..... 19
Atmosphere, physical phenomena of..... 22
Balloon, a North Pole*..... 20
Beetle, the elm leaf..... 22
Bicycle paint, glossy black..... 21
Bicycle tire inflater, Stanford's*.. 24
Bizerte, the new port of*..... 25
Blast furnace, Johnson's*..... 21
Books and publications, new..... 29
Cement for iron (6570)..... 20
Census, church..... 19
Cut, the draw..... 27
Cycle notes..... 19
Eaton, Prof. D. C..... 19
Eggs, preparing for invalids..... 26
Electric mirror..... 24
Electric drill, a portable*..... 24
Electric traction for steam roads. 20
Electrocution..... 28
Electric shock, an..... 27
Elevator attachment, Philbrick's*21
Ether, the..... 27
Fossil skeleton, an immense..... 24
Fruits, the acids of..... 22
Glucose as food..... 24
Hatchery, N. Y. State..... 18
Heron, the*..... 27
Huxley, Thomas Henry*..... 23
Inks, copying (6567)..... 29
Inventions, recently patented..... 28
Jonah and the electric lamp..... 23
Kutho Daw, Burmah..... 20
Lightning, photographs of..... 20
Lumber measure, Krueger's*..... 20
Medical discoveries, interesting.. 23
Milk as diet for the sick..... 26
Nails, cut and wire..... 25
Nozzle, the ball*..... 17
Papaya..... 22
Parks near cities..... 25
Photographs, coloring..... 27
Piano wire, motions of the..... 23
Pineapple growing in Florida..... 26
Pompeian bathroom, a..... 19
Press, the, Castelar on..... 28
Railways in Egypt..... 27
Ruwenzori..... 18
Seeds, curious..... 21
Shaft aligning device, Isgrig's*... 21
Sick, food and drink for the..... 26
Tortoise shell welding (6568)..... 29
Tree pests..... 22
Varnish, colorless (6569)..... 29
Venus, the notch of..... 20
Vessels, raising, Schon's apparatus for*..... 21
Water, salt, utilization of..... 26
Whistling device, automatic..... 24
Wood of most uses, the..... 18

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 1019.

For the Week Ending July 13, 1895.

Price 10 cents. For sale by all newsdealers.

PAGE

I. AGRICULTURE.—Prevention of Potato Disease.—From a leaflet circulated by the Irish Land Commission giving instructions for the application of the Bordeaux mixture..... 16294

II. ASTRONOMY.—The Depths of Space.—By Professor ROBERT S. BALL.—This very interesting paper gives some illustrations of what is known with regard to the distances of the stars..... 16293

III. ATHLETICS.—Military Gymnastics.—A description of the exercises in the School of Military Gymnastics near Paris.—6 illustrations..... 16279

IV. BOTANY.—The Functions of the Hairs of Plants.—By J. PENTLAND-SMITH.—9 illustrations..... 16292

V. CIVIL ENGINEERING.—A Line of Twenty-Eight Inch Cast Iron Submerged Pipes Across the Willamette River, at Portland, Oregon.—By FRANKLIN RIFFLE and ALBERT S. RIFFLE.—This paper gives interesting details of the method of laying the pipe in shoal and deep water, including the cradle used in laying the pipe.—4 illustrations..... 16281

Detroit River Dredging.—Large bowlders.—Details of the removal of obstructions to navigation..... 16280

VI. ELECTRICITY.—Popular Errors About Electricity.—By C. C. HASKINS.—This timely article takes up the distinction between "current" and "tension," terms which are grossly misused..... 16291

VII. MECHANICAL ENGINEERING.—The Development of the Experimental Study of Heat Engines.—This lecture gives interesting details of tests of steam engines, boilers, marine engines, the physical properties of steam, the foundation of thermodynamics, the founders of the rational theory, the experimental theory, and the conflict between the rational and experimental theories..... 16285

Rustless Coatings for Iron and Steel Paints.—Of what composed, how destroyed, classification as true pigments and inert substances, adulterants, etc.—By M. P. WOOD.—This installment treats of carbon paints, asphaltum, graphite and lampblack..... 16284

VIII. METALLURGY.—Treatment of Roasted Gold Ores by Means of Bromine..... 16287

IX. MINERALOGY.—Quicksilver Ores at Guadalcazar, Mexico.—By W. H. RUNDALL..... 16289

X. ORDNANCE.—The Seacoast Guns of the United States Service.—Details of the 8, 10, 12, and 16 inch seacoast guns and seacoast mortars.—The total cost of producing these guns and mortars for fortifying the twenty-seven principal ports of the United States will be $28,500,000..... 16280

XI. PHOTOGRAPHY.—Orthochromatic Photography.—2 illustrations..... 16291

Water for Photography.—By DUNCAN MOORE.—An important paper on a subject too often neglected by photographers..... 16290

XII. RAILWAYS.—The Intercontinental Railway Commission.—By E. Z. STEEVER, secretary of the commission.—A report of the Committee on Railway Communication..... 16280

Molten Metal by Railway.—A new process of working steel with economy..... 16287

Vestibule Equipment.—Illustrations of vestibules intended to shelter motormen and gripmen.—8 illustrations..... 16281

XIII. TECHNOLOGY.—Improved Oil Filter.—Designed for purifying the feedwater for the boilers of condensing engines by separating from it any oil which it may have entrained.—4 illustrations..... 16287

The Tin Plate Industry in the United States.—The first installment of an important paper, showing the phenomenal growth of this industry in the United States.—It has now developed to a point at which it enters into very serious competition with Great Britain.—1 diagram..... 16288

THE NEW YORK STATE FISH HATCHERY, COLD SPRING HARBOR.

A very commodious and cheerful looking building is that occupied by the New York Fish Commission at Cold Spring Harbor, Long Island. It stands at the level of the Sound, overshadowed on the west by forest covered hills. Between the highway and the building are the fish ponds, bordered with grass and separated from each other by flower beds and trees. The ground was given in perpetual lease by Mr. John D. Jones, the generous benefactor of the Biological School located here. This large frame building, erected in 1887, takes the place of the little brick one near by, where the work was at first carried on. Of the seven hatcheries in New York, this is the only one so near the coast that it is equally well adapted to raising both fresh and salt water fish. Another advantage is that during the summer months, when the fish need least attention, lobster hatching can be carried on.

The eggs are obtained from lobster men along the Long Island and Connecticut shores, who take them from the "swimmerets," where the female carries them for a year. They are brought in water to the hatchery and placed in tall glass jars; into the bottom of these a stream of salt water passes constantly, keeping the eggs in rapid motion; by means of a siphon, the water is carried out of the jar into a rectangular aquarium; with it go some eggs, and all the baby lobsters, as they burst their shells, straighten out and begin to swim upward.

Of these eggs, 6,900 weigh a liquid ounce, and from 125,000 to 130,000 are placed in each jar at a time; generally, within five days, all are hatched. When they have passed over into the aquarium, there is plenty of room for the struggle which begins with the first hour of the lobster's life. As we watch the rapid movements of the pinkish-white little things, just out of the shell, from a quarter to half an inch long, we see some are carrying or eating eggs. Here is one devouring one of his fellows, a trifle weaker than himself; there two are struggling for the body of a third; all are darting about as if for dear life.

At Wood's Holl, the experiment of putting just 100 little lobsters into a vessel together was tried; at the end of 30 days, only one remained—the fittest had survived.

Other kinds of food have been given to them, but the very young lobsters thrive best upon each other; but for this reason it is unprofitable to keep them long in the aquarium where we have watched them. When they are not more than three days old, they are carried in water to the reefs along the Sound, where they can hide among the rocks and grow in comparative safety, feeding upon each other and what other animal food comes in their way.

Lobster hatching is all that is carried on during the summer, but during the winter and spring tomcods and smelts are hatched by precisely the same method, and are turned into the Sound while not much thicker than a thread. It is interesting to learn that the quantity of both these fish and the lobsters caught along this shore has greatly increased since the hatchery has been in operation. Whereas, at first, the spawn was all brought from a distance, now it is obtained right here in the harbor. This seems easily credible when we are told that during the past season 32,000,000 tomcod and 41,000,000 smelts were hatched.

The greater part of the ground floor of the hatchery is taken up by the 16 troughs, 24 feet long and about 15 inches wide, in which the trout and salmon are hatched. The supply of water is pumped from a spring-fed pond into a reservoir above the hatchery and flows in a constant stream through these troughs from the first of November, when trout hatching begins, until spring.

The piles of black objects on shelves against the walls are the trays upon which the spawn is placed. They are simply narrow wooden frames strung with very fine wires, so arranged that they hold the eggs; but the fish, as they escape from the shell, can slip between them into the water. When the hatchery is in full operation, these trays, each holding 10,000 eggs, are placed five deep all along the troughs.

The process of preparing the eggs for hatching is done artificially. The spawn is taken from the females in the ponds when the experienced hand knows that they are about ready to deposit it; at the same time the "milt" is taken from the males. The two are quickly and carefully mixed in a pail and in this way fully 90 per cent of the eggs are fertilized.

The spawn is then ready to be spread on the trays already described. Then begins the constant and painstaking work of the foreman and his three assistants. They are kept busy removing empty shells, dead eggs and the sediment which collects continually. This cleaning has to be done by the movement of a feather, so easily may the spawn be injured.

The shades at the windows have to be regulated by the sun, for strong light athwart a line of troughs may quickly drive the tiny fish so close together that they are smothered and may even kill the eggs upon which it falls. Sometimes a streak of dead eggs in

© 1895 SCIENTIFIC AMERICAN, INC.

six troughs shows the path of a single chance ray of sunshine.

Last year the first eggs hatched in fifty-four days after they were placed on the trays. Some of our readers may not know that for the first forty-five days of a trout's life, he lives upon the yolk of his own egg. He is then about one and a quarter inches long. When these little fish are fifty days old, and therefore must be provided with more food than the water in which they have been hatched can supply, they are turned out into the ponds.

These ponds are shallow wooden boxes set in the ground. Through them the same kind of water as that in which they were born is always passing. The three varieties raised, the speckled brook trout, the brown or European trout and the beautiful rainbow trout, of California, are all put into ponds together, sorted by sizes only.

In large stone-walled ponds are the ancestors of these baby fish, separated according to their ages, the only safety for any being in their exclusion from those larger and stronger than themselves. Last year 1,050,000 trout were raised. We do not know what proportion of these are still here, but there are many thousands much larger, ranging to six years in age. An inventory of the stock has not been taken this season.

Besides these quantities of trout, there is a company of salmon with rich blue fins in a pond of their own, and a small number of Japanese gold fish, which are white, with brilliant red blotches on the back, some German "goldenide" and one great carp live harmoniously together in their own domain.

The most interesting time to visit these ponds is at five o'clock in the afternoon, when the fish receive their daily meal of sixty pounds of beef's liver. It is ground by machinery, that for the "fingerlings" being made very fine. As it is thrown to them, the larger fish leap from the water, and all seize it so quickly that by the time the water is clear and quiet again, it has disappeared. Very often there is a deathly struggle for some doubly coveted morsel.

Many experiments with foods have been tried; mussels, horseflesh, clams, etc., have all been tested, but so far, nothing has been found upon which all thrive, little and big alike, except liver.

The youngest take it for their first regularly administered meal, if not so voraciously, yet with just as good results, as their great-great-grandparents in the big ponds.

The transportation cans are worth looking at. They are of tin, cased in wood, and have large perforations in the covers. Each will hold 8 gallons of water and 5,000 little fish, for it is in these that they are sent to any part of the State where they are wanted. Traveling with them is no easy task. An expert may manage to care for ten cans as far as Albany, for instance, but he has no time to watch the express agent in whose car he travels. Every 20 minutes he must force air into each can, by means of a special apparatus; he must test the water very often, with the thermometer, and in the course of the journey he will have to pound up and put into the cans the 500 lb. of ice he carries as a part of his equipment, for trout need to live in water at only 55° Fah. Thus begins for the trout a freer but usually a shorter life in the pond or stream, where he is sure to fall a victim to one of his own kind or to a sportsman.

It will be interesting to see how long the Fish Commission under its revised administration, with paid officials from the president down, will do its work so economically that the State can afford to furnish the luxury of trout fishing. A. D.

The Church Census.

The census report, covering the statistics of churches, which has just come from the press, contains some interesting facts. It is an elaborate work of more than 800 pages, with colored maps showing the extent of the various organized religious bodies in the various States.

There are 143 distinct denominations in the United States, besides independent churches and miscellaneous congregations. The total communicants of all denominations is 20.612,806, who belong to 165,177 organizations or congregations.

These congregations have 142,521 edifices, which have sittings for 43,564,863 persons.

The value of all church property, used exclusively for purposes of worship, is $679,630,139. There are 111,036 regular ministers, not including lay preachers.

There are five bodies which have more than 1,000,000 communicants, and ten more than 500,000. The leading denominations have communicants in round numbers as follows: Roman Catholic, 6,250,000; Methodist, 4,600,000; Baptist, 3,725,000; Presbyterian, 1,280,332; Lutheran, 1,230,000; Protestant Episcopal, 540,000.

Prof. D. C. Eaton.

Prof. Daniel Cady Eaton, professor of botany at Yale, died at his home in New Haven, after an illness of seven or eight months.

The Future of the Great Arid West.

Mr. Eugene V. Smalley, editor of the North west Magazine, and perhaps one of the best informed writers on the resources and development of the great West and North west, contributes an interesting article on this subject to the Forum for June.

About one-third of our national area, he says, including Alaska, is too arid for cultivation, except where water can be put upon the soil by artificial means, and General Sherman's danger line, the hundredth meridian, defines pretty closely the western limit of safe farming by rainfall. The western boundary of the arid region is marked by the Sierra Nevada mountains in California and Oregon and the Cascade range in Washington. The only exception worth mentioning to the generally arid condition of this area is a crescent-shaped section including the eastern part of Washington and lapping over a little into Idaho and Oregon. The proximity of mountain ranges causes this country to receive local rains from the Pacific winds that have not been wholly robbed of their moisture. A large part of Southern California west of the Sierras is a desert, except where narrow strips of valleys have been artificially irrigated and turned into orange groves and vineyards.

The eastern boundary of this vast arid space, though approximately marked by the hundredth meridian, as before stated, cannot be accurately defined, as no mountain wall exists to cut off the rain-bearing winds. The country is a great plain from beyond the Canadian frontier to the Gulf of Mexico, and the rainfall steadily decreases as one goes west. A belt of debatable ground where successful agricultural operations are carried on year after year, called the sub-arid belt, extends through the Dakotas, Nebraska, Kansas, Oklahoma, Indian Territory and Texas, with a width varying from one to two hundred miles. All through this belt years of drought follow seasons of exceptional rainfall, and the population fluctuates accordingly. The country is only fit for a judicious combination of stock raising and grain growing on a moderate scale. One finds on every side abandoned farms and half deserted towns. Some of the Kansas counties lying in this region have been practically populated and depopulated two or three times.

The records of meteorological observations, made with unbroken regularity at the Western military posts, in some cases for a period of forty years, show temporary variations of climate, but permanent stability.

The vast domain of unquestioned aridity may be divided into four sections: the great grass plains, the mountain ranges, the enormous desert area occupying most of the country between the Rockies and the Sierras, and, finally, the valleys, where lie the only possibilities of future development in the arid region outside the mining districts. The meaning of the word "valley" is here restricted to the bottoms lying along the streams and the bench lands immediately contiguous, and does not include all the territory drained by the rivers and their tributaries. An idea of the proportion of the reclaimable and irreclaimable lands may be had by running a single furrow through a twenty acre field and letting the furrow represent the valleys that may, at greater or less expense, be watered by canals. The rest of the field will then show the relative area of the intervening table lands that must forever remain in their present condition.

The grass plains are the homes of flocks and herds, but support few towns and no cities; the mountains produce more wealth than all the farms between the hundredth meridian and the Pacific coast, but the population is shifting in character and will never develop the highest civilization, and the third division is just as absolutely a desert as Sahara. Only a thread of valley here and there can possibly be reclaimed. Desert tracts extend from Mexico nearly up to the British boundary and embrace nearly all of Arizona, New Mexico, Utah and Nevada, much of Wyoming, Colorado, Texas, California and Oregon, and the basin of the Columbia in the interior of Washington.

During the past few years the reclamation of the arid lands has been a subject of national interest, but all that legislation has done thus far is to prove that corporate enterprise must be depended upon for the future of irrigation, rather than appropriations from Congress or schemes financiered on the credit of the States. There can be no large additional settlements in the arid states without the building of costly canals, and Eastern or foreign capitalists must supply the money for such undertakings. Irrigation in the fruit districts of Southern California and in the interior of Washington has built up flourishing communities. Similar conditions will gradually prevail, as other valleys in the now arid States and Territories are reclaimed in the same way. A dense population will be attracted by the great productivity of such lands and the certainty of regular and large crops. Continuous villages will spring up from end to end of the canals, electric railways will carry the farmers' produce to the nearest railroad stations for shipment, and a high grade of rural civilization will develop.

Between these cultivated regions there will always remain a wild phase of far Western life on the broad stretches of irreclaimable lands. The realm of romance, courage and rude physical life will not disappear, but the sedentary dweller in the rich and populous valleys will be brought into close contact with the cowboy, the hunter and the miner.

Cycle Notes.

If there ever was a doubt as to the utility of the bicycle, in business or as a means of physical development, or of rational enjoyment, that doubt is dispelled, and even the most conservative is forced to acknowledge that the bicycle is as much of an institution as anything that has appeared in this century. Its conquests are not confined to any country, its use is not limited to any age, and both sexes are equally captivated by it.

The question that now confronts us is, whether it has reached perfection or whether it is capable of further improvement. We think a critical examination by an expert mechanician will result in finding many chances for improvement; perhaps not in its action, for in that respect it seems nearly all that can be desired, but no one can deny that the possibility of the failure of the tire or chain when the cyclist is twenty-five miles from home, without any means of transportation other than those nature furnishes him, is most serious, and calls for improvements, which have been attempted, but without complete success. A bicycle with a never-failing tire and gearing that is equal to all demands upon it is greatly needed.

We have folding cycles, tandems, and twin cycles, we have also the quadricycle, and many adaptations of the bicycle to special uses, such as military operations, mail carrying, ambulances, etc. We have seen a sedan chair on the bicycle principle, and it would seem that this idea might be followed out with profit.

A bicycle with pedals swinging very near the ground would be easily mounted, and would diminish danger in case of an upset. A cycle with smaller wheels and shorter and, consequently, more rigid frame might be a desideratum for business purposes. A tricycle with small wheels might be constructed so as to be convertible at will into a bicycle. Something has been done in this line, but we believe no practical results have been reached. This form of machine would be popular only with a class of timid riders, or of learners, but it would probably have its uses.

Another form of bicycle in which the saddle is dispensed with and the rider occupies a standing position is a possible modification, which might be useful.

It is not intended to convey the idea that inventors have not considered some of these subjects; but the fact that these ideas have not materialized indicates the necessity of greater energy in the bicycle business.

One of the most notable results of the phenomenal popularity of cycling is the marked effect of the bicycle industry on allied trades—and even upon trades that would seem, at first glance, to be wholly outside of any such influence. The nucleus of one of the large bicycle works in this country was a sewing machine factory, where wheels were made in one corner of the shop on a very small scale. Soon the making of sewing machines became secondary in importance, and was finally abandoned altogether for the more profitable bicycle business. This was only the beginning. Since the use of the wheel has become almost universal, many radical changes have been wrought. For instance, a large watch factory has gone extensively into the manufacture of cyclometers and is having difficulty to keep up with its orders. Another manufactory devoted to the making of knitting needles is now working night and day turning out nothing but bicycle spokes. The manufacture of pneumatic tires has become a separate branch of the rubber business, and several former hose factories have devoted their energies to it exclusively. Tire making, in turn, has led to the production of a naphtha free from paraffin or other oily matter for use in rubber cement. The careful workmanship required for bicycle making has had a marked effect upon the standard of the average artisan, and even upon machine shop practice at large. A case in point is that of a factory where all the lathes and other running machinery, including the shafts, have been fitted with the most approved style of ball bearings. The expense was, of course, great, but the owner finds that the efficiency of his works has been increased 25 per cent.

A spiral bicycle track is in course of construction in an old panorama building in Paris. This track is to be three stories high, the grade will be three-quarters of an inch to the yard, and the length 1,625 feet.

A Pompeian Bathroom.

The richest and most complete bath yet found in the ruins of Pompeii has recently been discovered. It is a large building, with sculptured basins, heating apparatus, lead pipes, and bronze faucets. The walls and floor are tiled. Everything is in an almost perfect state of preservation, owing to the roof having remained intact when the city was buried in the year 79.

© 1895 SCIENTIFIC AMERICAN, INC.

TO THE NORTH POLE BY BALLOON.

An expedition has now been organized to make the trip to the North Pole by means of a balloon. The chief of this adventurous aerial trip is M. Andrée, an engineer of the Patent Office of Sweden and a very able aeronaut, who has made a large number of remarkable ascents in Scandinavia, in one of which he crossed the Baltic in a small balloon. The expense, which will be about $36,000, has been defrayed by means of a public subscription headed by the King of Sweden, who has subscribed $8,000. The balloon will contain 6,000 cubic meters of gas, and is being constructed at Paris under the immediate direction of M. Andrée. The ascent will take place in the month of July, 1896, from one of the northwestern islands of the archipelago of Spitzbergen. M. Andrée has had a building constructed in Sweden to shelter the balloon during its inflation, as it may be a number of days before the wind will blow in the direction of the pole. M. Andrée will be accompanied by M. Nils Ekholm, the astronomer, who is now attached as physician to the Central Meteorological Bureau of Stockholm. The balloon will be constructed of double silk and the cordage will be very heavy, so as to resist the action produced by the heat of the sun on the balloon. M. Andrée has devised a very ingenious contrivance for directing the balloon. The efficiency of this device has been tested by a trip which he took on the 14th of last July. It is composed of a rudder sail secured to the apex of the balloon and to the car by a rope, so that it can move freely, and a guide rope which can be adjusted to different positions for 180 degrees of the circumference of the ring which is secured to the car.

Fig. 1.—M. ANDREE, THE AERONAUT.

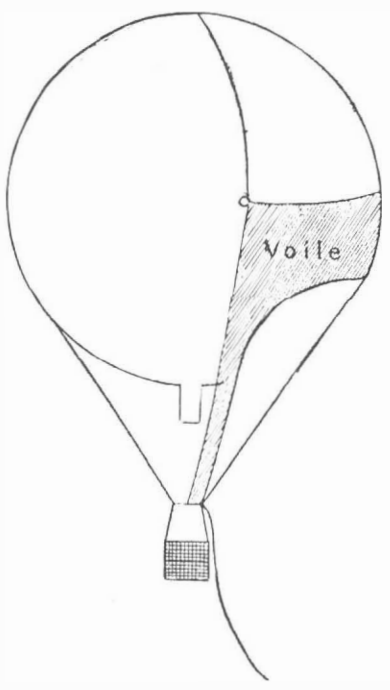


Fig. 2.—BALLOON WITH RUDDER SAIL.

The guiding is assisted by means of this guide rope, which is allowed to drag on the ground or in the water. The eyelets shown in Fig. 3 are intended to receive the hook of this guide rope. When the hook is attached to the central eyelet the balloon will move in the line of the wind, but by adjusting the guide rope to the other eyelets motion in other directions is obtained. The change is made with the aid of a differential pulley, as shown in our engraving. The aeronaut with this rudder sail, shown in Fig. 4, and the guide rope can change the direction of the balloon at will. In the season which M. Andrée has chosen the weather is usually fine in the Arctic regions, and there appears to be no good reason why the expedition should not be of great scientific value, even if the pole is not reached. The most favored of Arctic explorers rarely make more than four or five miles a day, so that the speed which can be obtained with a balloon will tend to do away with the great trouble which has heretofore blocked all the explorers—the shortness of the season.

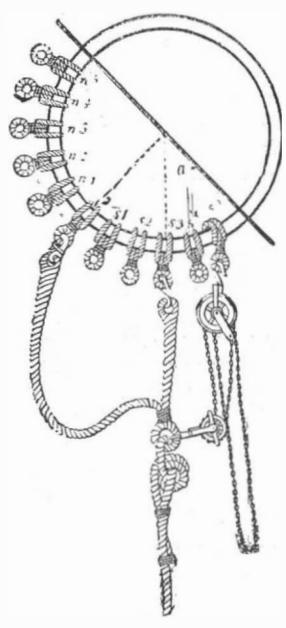


Fig. 3.—GUIDE ROPE ATTACHMENT.

A great deal of practical value has been accomplished by all the explorers, Kane, Franklin, Rodgers, Hall, De Long, Peary and others; but if success can be attained, incalculably greater benefits to science may be anticipated as the crown of such success. For our engravings and the foregoing particulars we are indebted to L'Illustration.

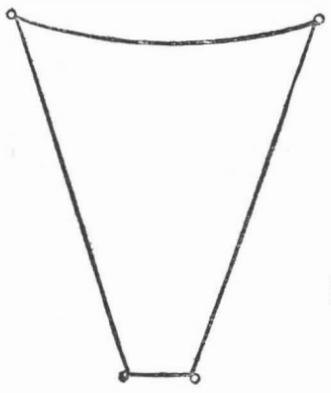


Fig. 4.—RUDDER SAIL.

Electric Traction Motors for Steam Railway Trains.

Within a few days past specially designed motors have been employed to haul, for a short distance, the regular trains of the Baltimore & Ohio Railroad. The service consists in hauling the trains through the great $8,000,000 tunnel, 7,430 feet long, under the business part of the city of Baltimore. The motors weigh 95 tons each, are 14 feet 3 inches long, and are of standard gage. They have two trucks and eight wheels, each 62 inches in diameter, and flexibly supported on each truck are two six-pole gearless motors, one for each axle. It is said that these motors are guaranteed to pull 1,200 tons at a speed of 30 miles an hour, and that, in a test, one of them was coupled to a six-wheel New York Central locomotive and pulled it up and down the track at will, although the best attainable pull was made by the steam locomotive against the motor.

This is but one more illustration of the manner in which the employment of electricity is being extended. We last week noticed some interesting trials of electric motors designed for regular service on the Nantasket Beach road, near Boston. The ease with which very high speeds could be obtained in hauling full passenger trains was amply demonstrated. Subsequent trials were made on the same road in the haulage of heavy freight trains and with equally satisfactory results.

That the electric motor may yet displace steam locomotives in the regular railway service of the country seems now a reasonable possibility, and one, too, in regard to which the principal question is that of relative cost.

Photographs of Lightning.

We have from time to time published interesting photographs of lightning flashes. The officials of the Weather Bureau are now making photographic experiments which they hope will prove valuable, not only to science, but also from a practical point of view as giving an idea of the necessary protection for houses in the city and country. Alexander McAdie has been engaged in investigating thunder and lightning since 1882. He has made a large number of interesting photographs of lightning, and this summer proposes to carry out an idea which was original with him. He hopes, with the aid of three cameras stationed at different points, to ascertain the actual dimensions and power of lightning flashes. The tip of the Washington monument has been selected as the point on which Mr. McAdie's three cameras are sighted. It is the most exposed object in the District of Columbia, the play of lightning around the tip being very frequent. One of Mr. McAdie's cameras is on the roof of the Weather Bureau, another in one of the committee rooms of the Capitol and a third is at a station back of Fort Myer, across the Potomac River. The distance from the three stations to the monument is accurately known, and Mr. McAdie's object is to get photographs from the three stations simultaneously of flashes of lightning around the Washington monument.

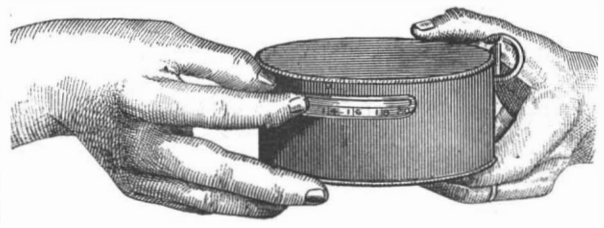
With the three cameras, the flash which is foreshortened from the Weather Bureau station will be visible in its entire length from the station at Fort Myer, or at the Capitol committee room. If Mr. McAdie should succeed in getting a photograph of a lightning flash from the three stations, the bolt itself will be afterward modeled and set up at the Weather Bureau. Computations as to that particular bolt can be made with considerable accuracy and the bolt would be valuable for comparison.

Mr. McAdie has also devised an interesting apparatus for measuring the duration of the flash. Inside of a camera there is a small tin plate with fasteners to receive a sensitized plate. This plate is made to revolve very rapidly. When the flash is photographed on the revolving plate, it will describe a curve making a certain number of revolutions around the center of the plate. As the number of revolutions per second is accurately known, the number of revolutions on the plate will give the exact part of a second the lightning flash has lasted. The results from this contrivance have been very successful. The Weather Bureau will shortly issue a pamphlet on protection from lightning, which was written by Mr. McAdie. It will give some important statistics of actual losses, together with the theory of protection.

There will also be directions for procedure in cases of apparent death from lightning stroke. Statistics show that in five years from 1890 to 1894, 1,120 lives were lost, an average of 224 lives a year. The greater number of accidents occur in the five months from April to September. The report will show that many persons injured by lightning stroke die because of a lack of proper attention. In many cases animation is merely suspended, the shock causing the sudden arrest of the respiratory and heart muscles. The directions are based upon Dr. Augustin H. Goelet's book, "How to Deal with Apparent Death from Electric Shock;" revised and modified for cases of apparent death from lightning by Dr. W. F. R. Phillips, of the Weather Bureau.

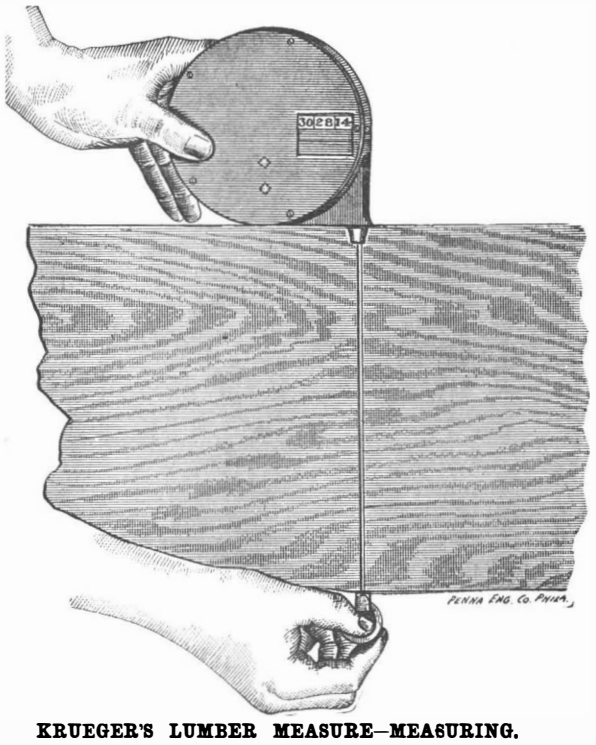
A REGISTERING LUMBER MEASURE.

The device represented in the illustration is an improvement upon an invention described in the SCIENTIFIC AMERICAN of January 12, for which an additional patent has been granted Mr. George Krueger, of Johnstown, Pa. In a suitable casing is arranged a



KRUEGER'S LUMBER MEASURE—SETTING TO LENGTH.

series of graduated gear wheels upon a rotatable shaft, registering devices having gear wheels loosely mounted on their supporting shafts being held in mesh with the graduated gear wheels. There is a clutch mechanism for each registering device to lock the gear wheel to its shaft, and a shifting device to actuate the clutch mechanism and positively connect the gear wheel of the corresponding registering device to its supporting shaft. The device is gaged to the length of



KRUEGER'S LUMBER MEASURE—MEASURING.

the lumber measure, and is not only a register, but calculates the figures in square feet of all areas over which the cable is extended. It is made to measure lengths of boards of twelve, fourteen, sixteen, eighteen, or twenty feet, but the apparatus may be arranged for measuring other lengths.

Kutho Daw.

Prof. Max Muller asks for money to photograph the inscriptions of the Kutho Daw, near Mandalay, in Burmah, before they are destroyed. The Kutho Daw is a collection of over 700 Buddhist temples, each containing a white marble slab on which part of the Tripitaka, the great Buddhist Bible, is engraved; together they give the entire work, which consists of 275,200 stanzas, or 8,808,000 syllables—nearly fifteen times the bulk of our Old Testament. The language is the Pali of the fifth century before Christ, believed to have been spoken by Buddha; the characters are the Burmese letters, and the text was revised by a learned commission. The dampness of the climate is rapidly effacing the inscriptions.

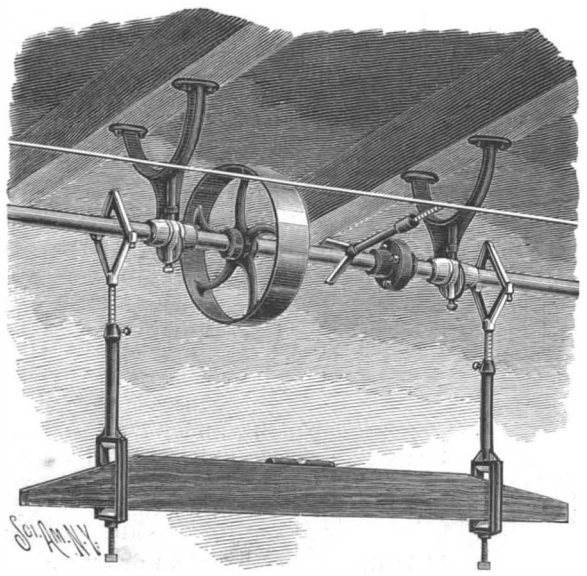
The Notch of Venus.

A cable dispatch received at Harvard Observatory July 2, from Professor Weiss, in Vienna, calls attention to a notch near the south horn of Venus, and asks American observers to note its time of visibility and disappearance.

© 1895 SCIENTIFIC AMERICAN, INC.

A SHAFT ALIGNING IMPROVEMENT.

To facilitate quickly and accurately running a line of shafting, irrespective of the different diameters of individual shafts in the line of pulleys, clutches, etc., Mr. Jacob M. Isgrig, of Traverse City, Mich., has patented the improvement represented in the accompanying illustration. A special tool is employed to measure the distance of the shaft from a stretched temporary cord, to find lateral discrepancies, and a pair of adjustable hangers supported on the shafting and carrying a level to find discrepancies at right angles to the

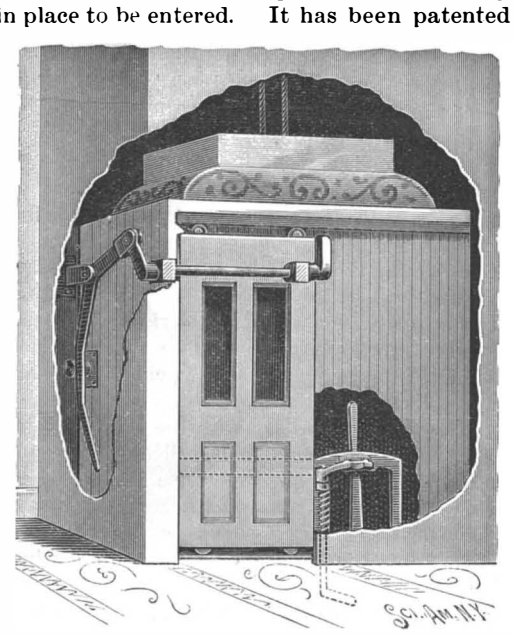


ISGRIG'S SHAFT ALIGNING DEVICES.

temporary cord. The measuring tool to be applied at different points between the shafting and the cord consists of a tubular body having at its closed end arms adapted to straddle the shaft, while in its open end a graduated bar is adjustable by means of a tapered thread and nut, to indicate the proper distance from the line of shafting to the temporary line. The hangers each consist of an angular loop, whose members are pivoted at one side and detachably connected at the other side, the loop being connected at its lower end with a graduated bar sliding in a tube, where it is held in adjusted position by a thumb screw. Connected with the closed lower end of the tube by a swivel is an open head, with knife edges at its top and bottom, to support a spirit level or a straight edge with a spirit level, the level being supported at its ends in the two heads as shown in the illustration. When the line of shafting to be leveled is supported from the floor, the hangers extend upwardly and the spirit level is supported upon the opposite knife edges of the open head, a detachable thumb screw and follower in the outer end of the head being then brought into use to clamp the hanger firmly to the straight edge or level.

A DOOR CONTROLLING ELEVATOR ATTACHMENT.

The illustration represents an improvement applicable to passenger and freight elevators to prevent the door of the cage from being opened when the cage is not in place to be entered. It has been patented by



PHILBRICK'S ELEVATOR ATTACHMENT.

Mr. Samuel M. Philbrick, of Portland, Ore. (box 845). On one side of the cage is a friction roller adapted to engage the vertical arm of a bell crank lever fulcrumed on a bracket attached to one of the posts in the shaft, the other arm of the lever being pivotally connected with an arm on a horizontal shaft having a stop arm adapted to move into and out of the path of the door. This stop arm remains in the path of the door when the cage is traveling between floors, but the friction roller at the side of the cage, as the latter nears the landing, swings the bell crank lever to move the stop out of the way, the door to the shaft thus remaining locked when the cage is away from the shaft entrance. To prevent the starting of the cage before the door is closed, a longitudinal ridge or projection on the door is adapted to engage a catch on a shaft on which is a torsion spring, and which turns in bearings on a frame secured to the cage, carrying the upper part of the starting and stopping lever. The free end of the catch has lugs engaging opposite sides of the lever, which cannot be moved by the operator until the door is closed. On the lower end of the shaft on which is the catch is an arm adapted to pass into a recess in the elevator shaft near each floor, preventing the up or down movement of the cage excepting upon the proper movement of the lever.

Curious Seeds and Their Use.

Queer seeds will be an interesting feature of the exhibit of the Department of Agriculture at the Atlanta Exposition, says the Washington Star. Among those shown will be various kinds employed for food by the Indians of North America. The latter eat the seeds of certain cacti, which are parched, pulverized and made into a palatable gruel. Their fondness for the seeds of some pines is well known, these "pinions" being to them what sugar plums are to white people. Sunflower seeds, too, they parch, grind, and make into cakes, which are said to be equal to corn bread. From the same seeds they get oil for anointing their bodies.

Seeds of many kinds have been found in the ruins of the ancient cliff dwellers of Utah, the evidence being satisfactory that they were used for food. Among these may be mentioned the common garden bean, which is also discovered in mounds in Arizona. Though of European origin, this vegetable was cultivated by the aborigines of this country at a very early date. The cliff dwellers used to eat the seeds of the ordinary "pigweed." Indians generally to this day consume the seeds of many species of grasses, making bread and mush from them. Along the rivers in Colorado and Arizona grass seeds are collected in great quantities for grinding into flour. Grape seeds, gourd seeds, and acorns are likewise employed.

The exhibit described will include a collection of poisonous seeds, such as the famous Calabar bean, which is said to be worse than strychnine. This bean is used by the natives for an ordeal. If a person is suspected of a crime, he is compelled to eat one, being judged to be guilty in case of death, which is almost inevitable. Another interesting seed, employed for a like purpose, is that of the "ordeal tree" of Madagascar. It is said to be the most deadly of all vegetable products. One of these seeds, about the size of an almond, will kill twenty men. The local name of the plant is "tanghinia." Yet another seed, alleged to be poisonous, is that of the common cockle, which, finding its way into wheat fields, poisons the bread made from the wheat. It is the bane of millers in the Northwest.

Another kind of seed, known to science as the "hyaenanche globosa" is powdered and sprinkled on meat, in the neighborhood of Cape Colony, for the purpose of poisoning hyenas. It is popularly supposed that horse chestnuts are very unwholesome. Nevertheless, in Turkey they are roasted for coffee, fermented for liquor and utilized for horse medicine. In India there is a kind of seed that varies so little in respect to size as to be used for a weight standard. It is called the "retti," and weighs one grain. From its name is derived the word "carat," which has come into occidental use.

A series of seeds employed as substitutes for adulterations of coffee will be shown, also seeds used for the illuminating oil they contain, for medicine, etc. An interesting seed is the betel nut, which is chewed, having a narcotic effect. Possessing wonderful properties as a stimulant is the famous kola nut of Africa. From Guatemala comes the candle nut, used for lighting. The main entrance of the Department of Agriculture is approached through an avenue of "ginko" trees imported from Japan, where their seeds are highly esteemed. But these trees do not fruit in this country, save in rare instances.

A special display will be made of seeds arranged according to their species in such a manner as to show the extent to which seeds in general are apt to vary in point of size. It is very desirable that farmers should obtain seeds for planting that are as big and plump as possible, for such seeds germinate more quickly than smaller ones, and the plants produced from them get a better start.

Glossy Black Paint for Bicycles.

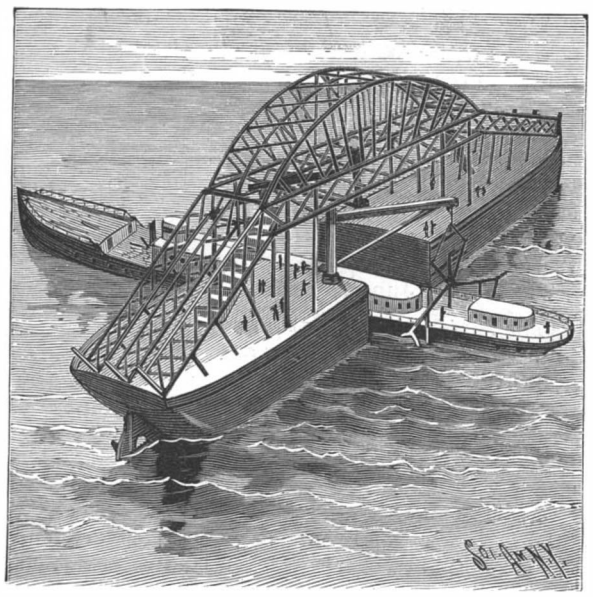
A glossy black paint can be made thus:

Amber	16 oz.
Boiling linseed oil	½ pint.
Asphalt	3 oz.
Resin	3 oz.
Oil turpentine	1 pint.

Melt the amber in the boiling oil, and add the asphalt and resin. Mix thoroughly, remove to open air, and gradually add the turpentine oil. Black japan also produces a good and cheap black enamel paint suitable for bicycles.

APPARATUS FOR RAISING SUNKEN VESSELS.

The illustration represents a two-part hull, with the parts rigidly connected with each other by an overhead framework, and carrying hoisting devices for raising a sunken vessel. It has been patented by Mr. Hubert Schon, cor. Kaiser and Haslage Avenues, Spring Hill, Allegheny, Pa. The hull parts support at their adjacent ends swinging cranes which carry grappling devices adapted to be raised and lowered by a hoisting chain. The grappling arms are held in extended or open position when being lowered to raise

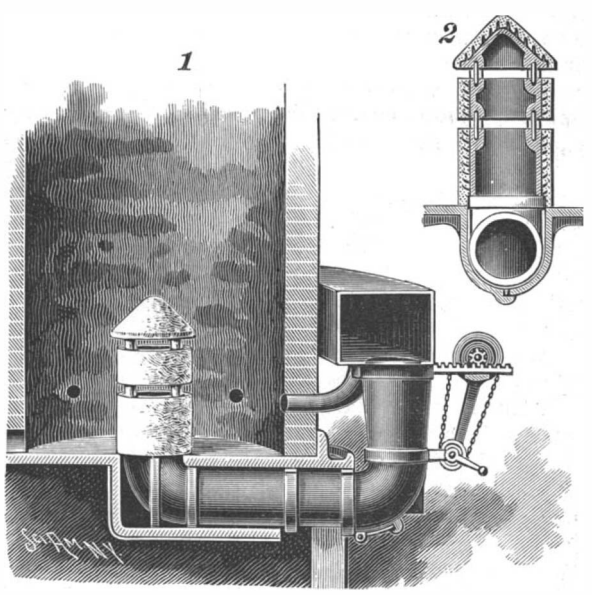


SCHON'S APPARATUS FOR RAISING SUNKEN VESSELS.

a vessel, but on contact with the vessel the arms are unlocked and the grappling hooks approach each other and engage the hull of the vessel. The chains are drawn up by windlasses on the cranes to raise the vessel. An indicator denotes the engagement of the grappling forks with the vessel. The precise construction shown in the illustration may be varied according to the work, and the raising apparatus may be made to raise stones and sand. An apparatus is also provided for locating sunken ships, and for the direction of the raising apparatus by telephone.

A BLAST FURNACE WITH CENTER BLAST.

In the furnace shown in the illustration air is forced to the center of the charge as well as supplied at the sides, making the whole interior of the furnace a melting zone, preventing gases going to waste, increasing the capacity of the furnace, and lessening the wear and tear on the lining. The improvement may be applied to any cupola. It has been patented by Mr. Charles Johnson, of Rutland, Vt. Fig. 1 shows the application of the improvement, Fig. 2 being a sectional view of the center blast pipe. Into the stack discharge tuyeres connected with the wind box in the usual manner, and a center blast pipe is also connected with the wind box, its discharge being controlled by a gate provided with a rack meshing with a pinion on whose shaft is a pulley turned by a driving pulley actuated by a crank arm. The center pipe is made in sections, a trap door in the bottom of one of its elbows facilitating the removal of any slag or metal that may run



JOHNSON'S BLAST FURNACE.

into the pipe. On the top of the section of the center pipe entering the stack is a series of sockets in which are pins engaging similar sockets in the lower end of the next pipe section above, and between these sockets are spacing collars to hold the sections a suitable distance apart, the size of the tuyere opening being varied by employing longer or shorter collars.

The upper pipe section is also similarly connected with a conical cap, forming a second tuyere opening beneath the cap. The pipe sections within the stack, and the cap, are provided with exterior pins or projections, to facilitate holding thereon a covering of asbestos or other incombustible material.

© 1895 SCIENTIFIC AMERICAN, INC.

Correspondence.

Tree Pests.

To the Editor of the SCIENTIFIC AMERICAN:

Will you please have the kindness to answer the following questions through the SCIENTIFIC AMERICAN? Last year a large size "cotton tree" in my yard had millions of worms on, and when they had eaten the leaves all off, they came down the tree and I destroyed them by burning kerosene and sulphur. I thought I had completely annihilated the whole lot. Then before the leaves started this spring I put a large quantity of common cotton batting around the trunk, with the expectation that, if any were in the ground, they could not get up the tree. There were no nests in the tree. Now, to my amazement, I find that there are again millions of little worms about three-sixteenths of an inch long, commencing their destructive business. Can you suggest anything whereby I can destroy these pests without injury to the tree? And how do they get there? GEO. BOXLEY.

Troy, N. Y., June 13, 1895.

[The Agricultural Department could not furnish the information desired from the description of the insect, and stated that the determination could only be made on receipt of some of the worms and leaves of the tree. They also stated that they did not know any such tree in New York State as the "cotton tree." Mr. Boxley sent the samples and wrote again, the substance of which is as follows:

"I have sent you by mail a box in which are some of the grubs spoken of, also a few leaves of the tree and a few yellow grubs that are beginning now to fall out of the tree. Last year I destroyed many of these yellow grubs and live worms by sweeping them up together and put on brimstone and kerosene and setting it on fire. I said cotton tree in my communication to you because I was under the impression that when it blows in the springtime the blossoms seem to shed a material resembling cotton The tree has been out in leaf only a short time, but these grubs have nearly eaten all the leaves up, and it is quite a large tree."]

The Imported Elm Leaf Beetle.

HOW TO PROTECT ELM TREES.

BY PROF. C. V. RILEY.

The insect so injuriously affecting Mr. Boxley's trees at Troy, N. Y., is the imported elm leaf beetle (Galeruca xanthomelæna). He is under a misapprehension in reference to the cotton blowing from the blossoms in springtime, as the leaves show that the tree is the ordinary American elm and not the cottonwood or the silver poplar, which are notorious for shedding an abundance of light cottony seed in the spring of the year. The elm leaf beetle in question confines its attacks to different varieties of the elm, and I have treated it pretty fully in past numbers of the SCIENTIFIC AMERICAN (vide more particularly SCIENTIFIC AMERICAN SUPPLEMENT, No. 431, 1884, p. 6885). The grubs referred to in the box sent are the pupæ of the elm leaf beetle. They do not fall out of the tree, but are produced at the base thereof, or under any rubbish near to hand, or just beneath the surface of the ground, from the larvæ which have done the damage to the leaves, and which, being full grown, have descended the trunk in order to transform into these "grubs" or pupæ. From these pupæ, in due time, come forth the parent beetles, which deposit their eggs in little groups, generally in a double row of five or six to a row, on the under side of the leaves. These eggs are orange-yellow and bottle-shaped, being broader at the base, or attached end, and terminating in a bottle-shaped neck.

The young larvæ hatching from these eggs always remain on the under side of the leaf, eating off the parenchyma and leaving nothing but the epidermis, and thus causing the leaf to become seared and brown. As they increase in size, they frequently eat through the whole substance of the leaf, leaving only the larger veins, so that the leaves become thoroughly skeletonized. The larvæ are darker when first hatched, undergo four moults and become lighter with each moult. The average duration of the egg state is about one week, that of the larva state less than two, and that of the pupa state about a week, so that in the height of the season the whole cycle of development from egg to perfect insect may take place in a month. The beetle assists the larva in its destructive work, eating around holes in the leaves, but does little harm as compared with the larva.

There are two or more broods of this insect in the latitude of Washington each year, but in ordinary seasons apparently but one in the New England States. The last brood of beetles seek shelter in outhouses, barns, holes in posts, or in any other shelter that they can find wherein to pass the winter, and they begin to lay their eggs as soon as the first leaves are fully formed. It is chiefly on the young and tender growth that the larvæ thrive.

The cheapest and most effective remedy, and one that can be easily applied to all trees of moderate or medium size, is to spray the under side of the leaves with Paris green, mixed at the rate of one pound to a barrel of water, four or five pounds of dextrine, molasses, or flour, or lime being added to increase the adhesiveness of the mixture and also to facilitate the suspension of the Paris green, which does not dissolve in the water. Another arsenical preparation, known as London purple, may also be used at the rate of about three-fourths of a pound of the purple to a barrel of water. It is important that in either case the powder should be pure, and, on the whole, it is easier to obtain a reliable article of Paris green, perhaps, than of the London purple. Of the different substances to be added, lime is, perhaps, preferable to the others, as it serves to neutralize any injury to the foliage from an excess of the poison. The main object of the spraying should be to cause a uniform amount of the spray to adhere to the surface of the leaves, and all nozzles which simply drench the tree and cause the liquid to run down in a shower to the ground should be avoided as far as possible. There is nothing better than the Vermorel modification of the Riley or Cyclone nozzle for this purpose, at the end of some extension rod. This will answer for trees from 30 to 40 feet in height, without ladder assistance; but trees that are taller than this can only be sprayed successfully by means of a ladder. Any good force pump attached to a barrel and mounted on a cart or wagon will answer the purpose, being manipulated by one man, while the other manages the nozzle. There are a number of different contrivances offered and advertised by various manufacturers, as the spraying of fruit trees, especially apples, with arsenical poisons has become a recognized part of successful apple culture. The same apparatus will prove equally effective against this elm leaf beetle. If one has a single tree to deal with, perhaps the least expensive method of spraying the foliage will be by means of a knapsack pump, which can be carried on the back, and which, with the assistance of a ladder, will suffice.

Should the correspondent desire further information, I advise him to send to the Department of Agriculture for Bulletin No. 10 of the Division of Entomology, a bulletin prepared by the writer and devoted to the subject.

The Papaya.

To the Editor of the SCIENTIFIC AMERICAN:

After exploring the many wonders of the Hawaiian Islands and their varied forms of tropical vegetation for more than six months, I have concluded that the marvelous and little known papaya, papaw, or Asiatic paw-paw tree and its fruit are fit to rank among the vegetable wonders of the world. Their effect on animal tissues is marvelous, and there is no excuse for tough meats where the papaya grows. The word is pronounced pap-pie-yae.

When I left the haunts of the white man and wandered out among the natives, I heard so many stories about the incredible pranks which the papaya juice performs on old fowls, the meat of bulls, and other tough animals, that I concluded to make a thorough test of it. As a result of my experiments I am able to report that the stories one hears are correct. It is simply marvelous the way the papaya juice transforms the toughest animal tissues into choice bits that would make a gourmet rejoice.

In company with Lieutenant John F. Bowler, late of the ex-queen's dragoons, I sought a noble papaya grove along the sandy beach of the famous Waikiki watering place. We gathered a bunch of stems and leaves from a lusty tree which had grown from seed planted only six months before. It was a noble specimen, about 20 feet high, and its seven-lobed leaves were about 2 feet in diameter. At so young an age the luscious yellow melon-like fruit hung in golden clusters from the tree's long and crooked branches. Before we expressed the juice of the leaves and stems we sat beneath the inviting shade and each ate one of the melons, which were delicious and not unlike cantelopes in appearance and consistency, though there was little similarity in taste. The fruit has a peachy flavor and is said to be a fine remedy for dyspepsia.

We readily secured about two ounces of the acrid, milky juice from our harvest. Taking it home, we put a few drops into a kettle of boiling water with a very old, tough fowl, which had been gathered in for the experiment. It had been boiling for more than an hour without becoming tender. The result of the papaya juice was magical. The papain, or active principle of it, dissolved the tissues at once and made the meat tender and palatable. A piece of very tough beefsteak was then wrapped in the leaves overnight, and it was a tender morsel for breakfast. The natives here say that the same results are obtained by hanging the meat in a tree among the saponaceous leaves. The mysterious juice differs from animal pepsin, in that its proteolytic action is not arrested or even delayed in neutral or alkaline solutions, as is the case with so many substances that enter the stomach. Its active principle is technically known as papayin, papayotin, or caracin, and there is no doubt that the Hawaiians have long known its value. LEIGH H. IRVINE.

Honolulu, H. I., May 15, 1895.

The Physical Phenomena of the Atmosphere.

A lecture on the phenomena of the high regions of the atmosphere was delivered recently at the Royal Institution by Prof. A. Cornu, F.R.S. Mons. Cornu began by comparing the atmosphere to an immense thermodynamic engine, the sun being the source of heat and the interplanetary space the condenser. The most interesting phenomena took place in the almost inaccessible parts of the atmosphere, and, though the difficulties of getting information about those elevated regions were great, yet he hoped to show that the physicist was beginning to know much of the real explanation of natural phenomena, and was even able to reproduce them in his laboratory. Among the unexpected static phenomena discovered by ballooning and in mountain observatories, M. Cornu instanced three—namely, the facts that many clouds which had generally been regarded as consisting of vapor were composed of minute crystals of ice; that at different heights the direction of the wind was different; and that the temperature did not get steadily lower as the earth became more distant, but that alternate layers of hot and cold air were encountered. The first and last of these facts might have been ascertained by indirect means from consideration of certain optical phenomena. From the solar halo might be inferred the presence of ice crystals in cirrus cloud; they had the power of refracting light, and refraction of the sun's light by passing through cloud would fully explain the halo. It could be reproduced artificially by passing a beam of light through a strong solution of alum, with a little alcohol added. The alternations of heat and cold in the atmosphere were deducible from the various forms of mirage, which depended on the reflection of light from the surface of the different layers. M. Cornu gave an ingenious reproduction of the "Alpine glow," sometimes seen in the Bernese Oberland, for an example. A valley between two peaks would become filled with hot air under the influence of the sun, and the path of the rays of light reflected from the surface of the hot layer would be convex as regarded from the earth. After sunset the hot air would rise and the cool take its place, thus producing a hot layer of air above a cooler one. The light from the sun would now be reflected into a concave ray, which would bend down and illuminate the mountain, though the sun was in fact below the horizon. M. Cornu then proceeded to speak of the dynamic phenomena of the air. He said that the solar energy was of three kinds—mechanical energy (appearing as winds, cyclones, etc.), calorific energy (shown by the change of the state of matter, as of water into vapor), and electrical. He only proposed to deal with the first of these. The wind was the most simple mechanical manifestation, and had its origin in the difference of atmospheric pressure in two distant places. It never blew in the direction of the line joining the points of greatest and least pressure, but always obliquely to the isobarometric lines, and usually with a circular movement round the points of highest and lowest pressure. When from any cause the equilibrium of the atmosphere was broken down, circular movements of enormous force, such as tornadoes and cyclones, were set up. The lecture concluded with the exhibition of an artificial waterspout.

The Acids of Fruits.

The grateful acid of the rhubarb leaf arises from the malic acid and binoxalate of potash which it contains; the acidity of the lemon, orange, and other species of the genus Citrus is caused by the abundance of citric acid which their juice contains; that of the cherry, plum, apple, and pear from the malic acid in their pulp; that of gooseberries and currants, black, red, and white, from a mixture of malic and citric acids; that of the grape from a mixture of malic and tartaric acids; that of the mango from citric acid and a very fugitive essential oil; that of the tamarind from a mixture of citric, malic, and tartaric acids; the flavor of asparagus from aspartic acid, found also in the root of the marshmallow, and that of the cucumber from a peculiar poisonous ingredient called fungin, which is found in all fungi, and is the cause of the cucumber being offensive to some stomachs.

It will be observed that rhubarb is the only fruit which contains binoxalate of potash in conjunction with an acid. Beet root owes its nutritious quality to about nine per cent of sugar which it contains, and its flavor is a peculiar substance containing nitrogen mixed with pectic acid.

The carrot owes its fattening powers also to sugar, and its flavor to a peculiar fatty oil; the horseradish derives its flavor and blistering power from a volatile acrid oil. The Jerusalem artichoke contains fourteen and a half per cent of sugar and three per cent of inulin (a variety of starch), besides gum and a peculiar substance to which its flavor is owing; and, lastly, garlic and the rest of the onion family derive their peculiar odor from a yellowish, volatile acrid oil, but they are nutritious from containing nearly half their weight of gummy aud glutinous substances not yet clearly defined.—G. W. Johnson, in the Chemistry of the World.

© 1895 SCIENTIFIC AMERICAN, INC.

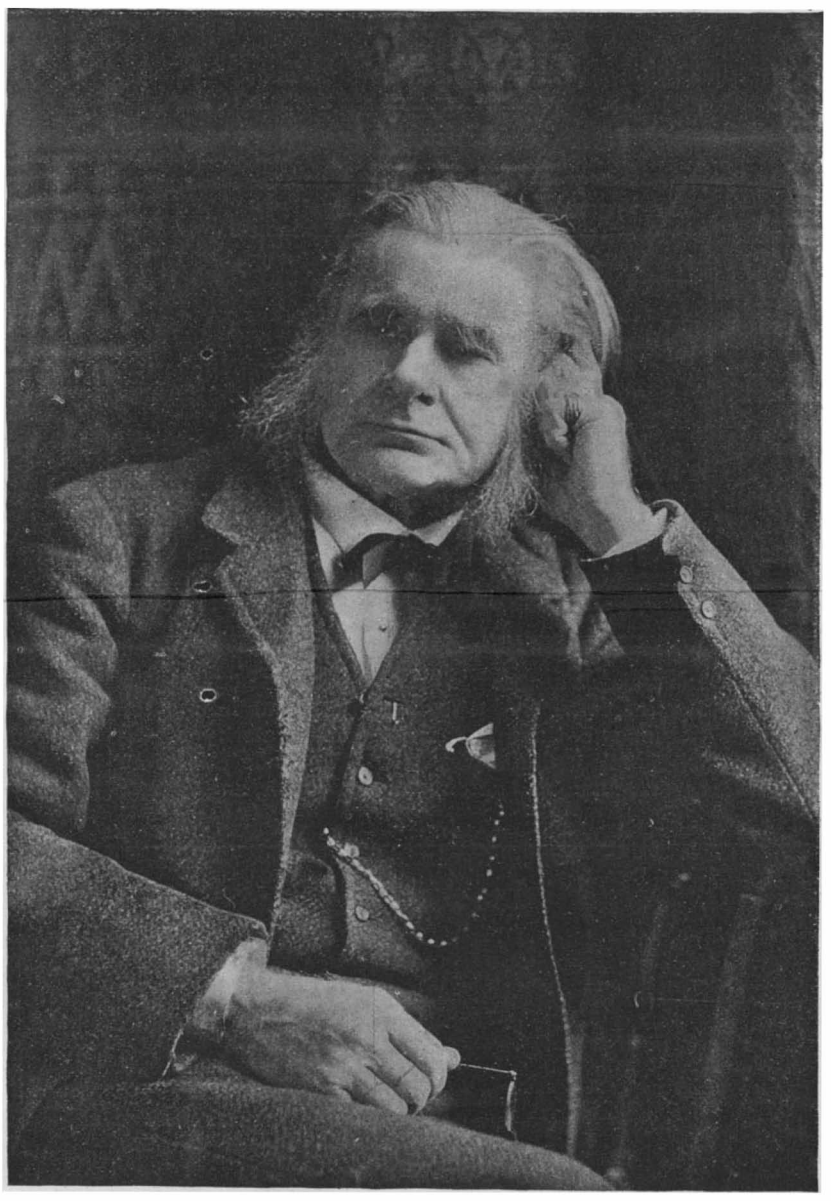
THOMAS HENRY HUXLEY.

The eminent naturalist, Thomas Henry Huxley, died at Eastbourne, England, on the 29th of June, 1895, his mind remaining clear to the last. In the death of Professor Huxley science loses one of its foremost exponents and the world one of her most interesting characters. The position of Huxley was unique, and his death now leaves Herbert Spencer the sole survivor of the grand quartet of mental giants, Darwin, Tyndall, Huxley and Spencer, who succeeded in forcing their views regarding man's relations to lower forms of life and to the cosmos, commonly called "evolution," upon an unwilling and recalcitrant public. Dr. E. L. Youmans defined Huxley's position in the world of science as that of a "philosophical biologist," and as such he ranked among the very first of the world. By his individual work in biology Huxley made important additions to the facts and truths gathered by Charles Darwin from his observations on animals and plants and by Tyndall in physics and Mr. Spencer in sociology. Upon these sciences taken collectively the doctrine of evolution is based. Like all evolutionists, Huxley soon ran foul of the churchmen and was denounced as an infidel. He denied the insinuations, and in 1869 he invented, or rather revived, the term agnostic. To the new doctrine of agnosticism, of which he was the champion, and to his attacks on religion, was due much of his fame. He was at all times an intrepid defender of science, and he was a tower of strength to the evolutionists.

Professor Huxley was born in 1825, at Ealing, Middlesex, England. He was educated at Ealing School, at which his father was a teacher. At the age of seventeen he entered the Charing Cross Medical School, and after three years of hard study he graduated with the degree of bachelor of medicine, taking high honors in physiology. He then entered the naval service as surgeon and accompanied Captain Stanley's expedition to the Eastern Archipelago, and during the voyage made observation on the natural history of the sea, devoting special attention to the Medusæ. On his return to England he was appointed to succeed Dr. Edward Forbes as professor of paleontology at the Government School of Mines in London. He was also made Fullerian professor of physiology to the Royal Institution and examiner in physiology and comparative anatomy of the University of London. In 1856 he went with Tyndall on his first trip to the Alps. In 1858 he was made Croonian lecturer to the Royal Society. At this time Huxley gave numerous lectures on "The Relation of Man to the Lower Animals." In 1863 he was made professor of comparative anatomy at the Royal College of Surgeons and remained there seven years. In 1872 he was made lord rector of Aberdeen University, and in 1873 he was made secretary of the Royal Society. On the death of Frank Buckland, in 1881, he succeeded that naturalist as inspector general of fisheries, and on the death of Mr. Spottiswoode, in 1884, Professor Huxley was elected president of the Royal Society. Professor Huxley made a visit to America in 1876, where he gave some remarkable lectures, which were published in the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 41, 42, 43 and 44. Professor Huxley was a member of the principal scientific societies of the world and received many honors and decorations. He had the degrees of LL.D., Ph.D., D.C.L. and M.D. conferred upon him.

Professor Huxley began his literary work while he was studying medicine at the Charing Cross Hospital. His writings did much to popularize science. They include "Oceanic Hydrozoa" and "Man's Place in Nature," 1863; "Lessons on Comparative Anatomy," 1864; "Lessons in Elementary Physiology," 1866; "An Introduction to the Classification of Animals," 1869; "Lay Sermons, Addresses and Reviews," 1870; "Manual of the Anatomy of Vertebrated Animals," 1871; and "Critiques and Addresses," 1873. Other works were on "Origin of Species," "More Criticism on Darwin and Administrative Nihilism," "American Addresses," "Physiography," "The Crayfish," "Science and Culture," and the "Advance of Science in the Last Half Century."

For the last ten years Professor Huxley has been practically in retirement. He had a contempt for autobiographies, but he once sketched his own character in a few words. "That man," said he, "has a liberal education who has been so trained in youth that his body is the ready servant of his will and does with ease and pleasure all the work that as a mechanism, it is capable of; whose intellect is a clear, cold logic engine, with all its parts of equal strength and in smooth working order, ready, like a steam engine, to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of Nature and of the laws of her operations; one who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to halt by a vigorous will, the servant of a tender conscience: who has learned to love all beauty, whether of Nature or of art, to hate all vileness, and to respect others as himself. Such a one, and no other, has had a liberal education." The world can add no higher tribute to the author of these words than to say that such a man was Thomas Henry Huxley.



THOMAS HENRY HUXLEY.

Motions of the Pianoforte Wire.

The motion of a pianoforte wire when struck has been investigated by Herr W. Kaufmann, whose paper on the subject in Wiedemann's Annalen and noticed in Nature, is accompanied by a set of very interesting photographic records, obtained by a modification of the method invented by Raps and Krigar-Menzel. By vibrating the wire in front of a luminous slit, and throwing the image of it upon sensitive paper rotating upon a cylinder, a white line is traced upon a black ground. This line, which is due to the interruption of the luminous slit by the opaque wire, exhibits all the motions of the particular point in the wire which is crossed by the slit. In order to bring the plane of the slit into exact coincidence with the wire, an image of the slit, produced by a lens with the aid of the electric arc, was thrown upon the wire itself. Since the hammer struck the wire at the point photographed, the motion of the wire was traced from the very first, the commencement of the vibration being the most interesting stage. Hard and soft hammers were tried, the latter corresponding to those actually used in the piano. It was found that the duration of contact is longer with feeble than with hard striking. As the force increases, the duration of contact rapidly approaches a limiting value equal to that of a hard hammer of equal weight. But the practically most important resultant was the proof that when a wire is struck at a point between one-seventh and one-ninth of its length, the fundamental tone has a maximum, and the harmonics—especially the third—are very feeble. Hence a wire thus struck gives its strongest and richest tone. This fact is acted upon by piano builders, but is not explained by supposing that the notes of the higher harmonics are struck, thus preventing their being heard. They are heard, but are outweighed by the more harmonious ones.

Interesting Medical Discoveries.

Several interesting medical discoveries have recently been made in Vienna, and announced at meetings of the Society of Physicians. Thus, Prof. Wagner von Jauregg, who is in charge of the department in the university devoted to mental diseases, was induced by the improvement that always follows upon an infectious disease in cases of insanity, especially if it is accompanied with high fever, to bring about that condition artificially by means of inoculation with Koch's tuberculin. He now claims that, though the decidedly favorable symptoms soon disappeared after each injection, there was such a steady clearing of the confused sensorium as to encourage him to continue the experiments. In the course of a discussion that ensued, it was mentioned by Prof. Albert that transfusion of blood and subsequent high fever had caused astonishing changes in the mental condition of one of his patients, whose pronounced melancholia had disappeared as if by magic, after the fever had subsided.

He, too, anticipated good results from the artificial production of high fever in persons mentally deranged.

Dr. Riehl, a lecturer at the same university, also has made a curious discovery. A man was recently brought into his ward suffering from blisters and swellings on his hands, as well as on one eye, which he had touched with a swollen hand. The man was a gardener, and he attributed the blisters to a species of primrose, Primula obconica. Experiments were made and it was found that the tiny hairs on the leaves and stalks irritated the skin and gave rise to swellings and inflammation. Dr. Riehl succeeded in extracting the poison which the plant contains, apparently for its own protection, and, by means of injections with it, claims to have healed more than one obstinate skin disease. His experiments are not yet completed, but they promise good results.

The sero-therapeutic method, applied with so much success in the cure of diphtheria, has recently been applied by Messrs. Hericourt and Richet to the treatment of cancer. They collected the serum of the blood of an animal which they had inoculated with a solution containing cancerous or carcinomatous debris. Then, with a few cubic centimeters of this virus, they inoculated two patients afflicted with cancerous tumors of the abdomen or the stomach. In both cases the tumor diminished and there was a manifest improvement. These are results worthy of attention. Although it cannot yet be said that cancer is conquered, this is an important step toward victory.

Jonah and the Incandescent Lamp.

One of the most interesting sights of New York is a performance at one of the Jewish theaters on the Bowery, there being several near Canal Street patronized exclusively by Russian Hebrews, in which the plays are produced in the Jewish-German-Russian jargon with a mediæval crudity. Each theater has its own playwright, who, however, owing to the fondness of the audience for realistic scenes, has to divide the honors of the reproduction with the important personage who creates the realistic accessories.

How important the functions of the latter are, says the Electrical World, will be evident from the following description of a scene from a play entitled "Jonah," produced at the Old Bowery Theater.

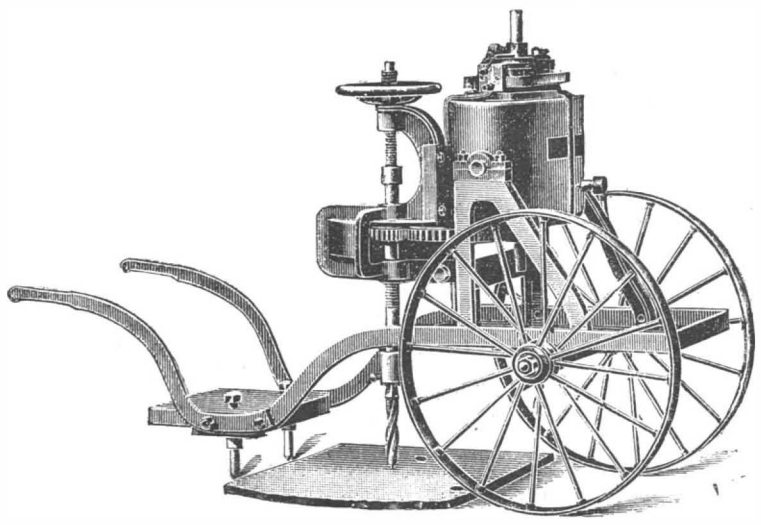
"After Jonah has been thrown overboard, for a moment," says the reporter, "it appears that nothing can save him. But, just as he is sinking for the last time, a great fish comes along, shaped something like a flounder, and deporting itself like a ball of rubber; it opens a very wide mouth and Jonah climbs in. Instantly the ship, which has been hammering the stage boards in its wild tossing, becomes still. The ballet sailors on the deck set up a jubilant chorus, and a gauze-dressed angel drops down from the flies, while the fish—which has disappeared behind the scenes—turns about and re-enters with a new side presented to the audience. This new side is as open as the day. Through an oval window in the whale's larboard quarter Jonah is disclosed sitting in great splendor of red and green, with glow lamps, and not a suggestion of discomfort."

THE highest temperature in the world is recorded in the great desert of Africa, where the thermometer often marks 150 degrees Fahrenheit.

© 1895 SCIENTIFIC AMERICAN, INC.

PORTABLE ELECTRIC DRILL.

We illustrate a neatly arranged portable electric drilling machine designed by Mr. F. Kodolitsch, which, it is claimed, can be adapted to almost any job, however difficult or inaccessible, and the inventor has developed a large number of different types which are employed in the arsenal of the Austrian Lloyd's Steam Navigation Company. Here, where the workmen are 2,000 in number, only an exceptionally small number of holes are now bored with the ratchet brace. A net of electric wires extends all over the place, and each



PORTABLE ELECTRIC DRILL.

shop is provided with a number of special drilling machines and the necessary cables, so that any man who requires to bore holes has only to wheel the small portable drill to the work and complete the operation at his bench, and thus saves much time. One of these machines is intended for boring holes in the deck of a steamer to receive the screws holding the planking in place. As will be seen from the engraving, the machine is mounted on a carriage and can thus be easily moved from place to place. The motor is slung on trunnions and drives the drill spindle by means of gearing. The spindle is fed forward by means of the hand wheel shown. It is stated that with this device a man and a boy can bore 400 ½ inch holes in ½ inch deck plates per day. When used for countersinking, the work done is from 800 to 1,000 holes per day. For this latter operation the feed is not touched at all. The workman simply lifts the countersinking bit out of one hole by elevating the handles, wheels it to the next, and dropping it in keeps it there till the operation is completed.

In our other illustration the drill is shown at work in the somewhat awkward job of drilling the rivet holes for a furnace mouth. In this instance the machine is wheeled up to the front of the boiler and connected to a special drilling bar by a flexible shaft. In the fitting shop of the arsenal the machines have been largely used. Thus a large condenser may have all holes bored on one side while it is being planed on the other.

A condenser for a 5,000 indicated horse power marine engine has thus been finished complete without removing it from the table of the planing machine; even the seats for the air pumps were completely finished by a boring bar driven by one of the portable electric machines. Where necessary, these latter can be slung by means of tackle, thus enabling work to be done in almost any position. In the ship yard the machines have proved extremely useful, not only for drilling and countersinking all rivet holes, but also for cutting out side lights, scuttles and hawse pipe holes. The sternpost bushes may also be bored out in a similar manner.

In repairing stranded ships the machines have proved very convenient for drilling out the rivets of the plates to be replaced.

We are indebted to Engineering for our illustrations and the foregoing particulars.

Electric Mirror.

A so-called electric shaving mirror has made its appearance in England. The electric feature consists of a beveled frame of translucent material, behind which is an electric incandescent lamp and reflector. The light is thus thrown directly upon the face of the user, with an entire absence of shadow. The lamp has a flexible cord and socket attached and can be connected instantly with any existing electric fixture.

The device is made by Messrs. Evered & Company, Limited, 27 Drury Lane, London.

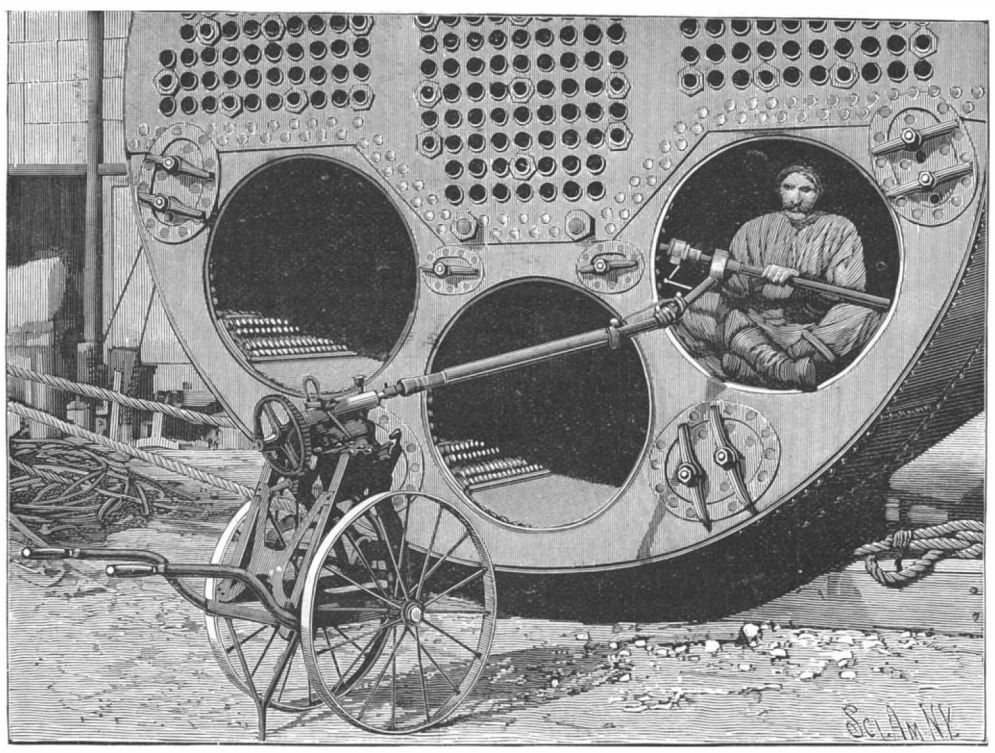
An Immense Fossil Skeleton.

The fossil remains of a huge sea animal are being exhibited in southeastern Kansas. The discoverer came upon them accidentally while looking for firewood in the Cherokee Strip. The head, bill, some vertebræ, a few ribs, and the propellers were in a fair state of preservation, but the remainder of the skeleton crumbled as soon as it was exposed to the air. The bones were purchased by Henry Patterson, of Humboldt, Kan., who at once sent a description of them to the director of the National Museum at Washington. The letter was submitted to the secretary of the Smithsonian Institution, with the request that a qualified man be sent to investigate the discovery. The fossil is thus described by Dr. R. L. Patterson in a letter to the Registered Pharmacist, of Chicago:

"The eye sockets are 4 feet in the long diameter with a space of 20 inches between them, making a skull diameter of 8 feet and 8 inches. It has a pointed bill or beak 12 feet long and a small brain cavity comparatively. The vertebræ measure 12 inches each way, and the distance from tip to tip of the transverse processes is 40 inches, and resemble those of a mammal rather than a fish. The ostryodes is 38 inches long; a rib is 13 feet and 8 inches long, circumference 33 inches, and two triangular shaped bones 3½ by 12 feet, the use of which is conjectural, but supposed to be propellers or fins."

Automatic Whistling Device.

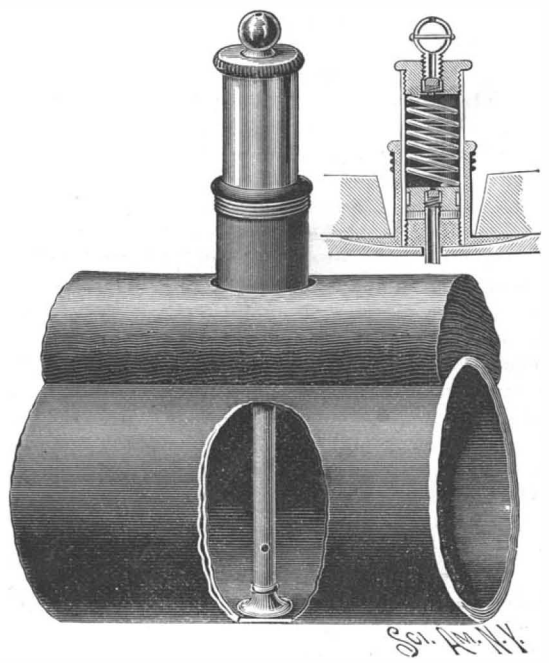
While there are many wonderful devices on the new lake steamer North Land, to make her navigation safe in every way, there is none showing the power of invention as well as the automatic whistling device. In connection with this device there is a system of electrical wiring to all parts of the bridge, by which the great whistle can be blown at will by the pressing of a button. To blow a fog signal regularly every 60 seconds it is only necessary to put in a connection which puts the whistle in control of the electrical clockwork, and it needs no further attention, as it will blow all day at regular intervals; and every time it blows, a stamping device in connection with the clock registers on paper tape the date, hour and minute when the signal was given, as well as duration of blast. In case of some steamer getting across the bow of the North Land during a fog, and being cut in two, the testimony of this tape showing the regularity of the fog signals would be valuable. The same clockwork registers time and date of passing signals, and when a passing signal is blown it disconnects the automatic whistle, but it can be connected with the pressure of another button. The valve which opens the whistle throttle is very finely balanced, and when the dynamo is not running it can be blown by hand with the strength of one finger. By means of this tape no claim can be made for cross signals when they were not blown. Another feature is the promptness with which the whistle is blown. It responds instantly to the button. The electrical power required to operate the whole device amounts to that used by a 16 candle power lamp. In addition to the gong signal between the bridge and engine room there is the Chadburn telegraph, which permits of no mistakes. To make assurance doubly sure, however, for contingencies arising that could not be signaled, there is a regular telephone in the dog box connected with one in the engine room.—Marine Review.



PORTABLE ELECTRIC DRILL.

AN AUTOMATIC BICYCLE TIRE INFLATER.

This is a device for keeping the pneumatic tire of a wheel inflated to the desired degree, the device being



STANFORD'S AUTOMATIC TIRE INFLATER.

adjustable for maintaining a hard or soft tire, as may be preferred. It has been patented by Mr. Philip W. Stanford, of San Francisco, Cal. The large figure represents the device applied, the piston rod of the pump being seen through a cut-away portion of the tire, while the small figure is a sectional view of the pump. The piston rod is hollow, and has at its lower end a foot piece normally abutting against the inner surface of the outer wall of the tire, and an air exit port communicating with the interior of the tire. There is in the piston head a port controlled by a spring-pressed valve, and in the head of the cylinder is a port formed in the plug of a dust filter screwed into the head, the latter port being also closed by a spring-pressed valve, while within the cylinder and between its head and the piston is a spring to return the piston. The connection between the piston and cylinder and the wheel is made by a flexible sleeve, a foot flange of which is clamped between the outer surface of the rim and the inner wall of the tire, the packing and sleeve allowing the parts to yield to side strains on the piston rod. The desired degree of tire expansion is obtained by varying the projection of the piston rod into the tire by screwing the rod farther into or out of the piston, or by similarly adjusting the foot piece, or by the adjustment of the encircling sleeve. In operation, each time the tire presses upon the ground and is compressed at the point opposite the foot of the piston rod, the upward movement of the latter allows the air in the cylinder to pass into the tire, and on the piston being forced downward by the spring air is drawn into the cylinder, the air drawn in passing through a filtering diaphragm designed to free it from dust.

Glucose as Food.

In a recent issue of the Literary Digest, published by Funk & Wagnalls, New York, an account is given of a paper by Dr. E. H. Bartley, recently read before the American Chemical Society, in which Dr. Bartley condemns the long accepted opinion that commercial glucose is suitable as a food. The Medical News, commenting on this, says that this opinion was promulgated some years ago by a committee of American chemists, appointed partly under government auspices, and it has been made the basis for justification of much substitution and adulteration.

Dr. Bartley says that mere chemical knowledge, or even experiments on the lower animals or healthy subjects for a brief period, are not sufficient to establish the harmlessness of a substitute food. Glucose made from starch by the action of acid is not the same as the product of digestion by animal ferments, and it is not likely that it will be a satisfactory substitute for the forms of sugar that arise in the process of normal digestion.

© 1895 SCIENTIFIC AMERICAN, INC.

THE NEW PORT OF BIZERTE.

At the time when Germany was celebrating the opening of the Baltic and North Sea Canal, France also threw open for navigation a canal and port of great importance to the commerce of the Mediterranean. On the 4th of June, three divisions, forming the active squadron of the Mediterranean, took possession of the new port of Bizerte. Bizerte, or Bizerta, is the most northern town in Africa, and is a fortified seaport of Tunis. The new canal gives access to the Lake of Bizerte, thus forming an interior basin as large as the city of Paris. The lake is 12 kilometers (seven miles) in diameter, and the depth is 10 to 12 meters (32 to 39 feet). The entire navies of all nations could be floated on this lake. High hills and marshy lagoons render the lake inaccessible except by way of the canal. It was only necessary to cut a navigable canal through this isthmus to render this great roadstead accessible. The canal is 1,500 meters (4,920 feet) long, 120 meters (393 feet) wide, and 9 meters (30 feet) deep. Its entrance is protected on each side by jetties 1,000 meters long.

On the 18th of March, 1894, the works were advanced sufficiently to allow the steamer Ville-d'Alger, drawing five and one-half meters of water, to pass through. The new port will shorten the distance between Marseilles and Tunis. We give a map of the lake and port and a view of the French cruiser Suchet traversing the canal at the opening on June 4, for which we are indebted to L'Illustration.

Laying Out Parks Near Cities.

In very many cities throughout the country there has been, within the last half dozen years, a praiseworthy spirit of enterprise developed in the laying out of park areas, in anticipation of the occupation of the contiguous territory by a more dense population. New York has thus added to her park lands a great area of territory possessing splendid possibilities on her northern borders; Brooklyn is laying out great additions to her park lands, including a noble driveway on the shores of the bay and ocean, and Chicago already has completed a magnificent park system, including more excellent roads for driving than can at present be found in the immediate neighborhood of any other large city. In Essex County, N. J., a region so near New York City as to afford a place of residence for very many of its business men, a movement for the establishment of a system of parks and parkways has lately been successfully inaugurated. Commissioners have been appointed for devising the best scheme for a public park system which shall benefit the whole territory west of the Passaic River and the city of Newark, including the Oranges and Belleville, Woodside, Bloomfield and Montclair. The system is designed to make every home in the entire section more attractive and valuable. For the complete success of the scheme,

PLAN OF THE PORT AND LAKE OF BIZERTE.

however, on the broad grounds desired, particular care has been taken to secure a board of commissioners which will impartially represent all the different localities, that the entire system of parks and roadways may have the unity and harmony of a single plan. The chairman of the committee most active in pushing the matter, Mr. Frederick W. Kelsey, has received from the secretary of the Metropolitan Park Commission, of Boston, an appreciatingly discriminating commendation of the position of the committee in this respect, and urging the importance of the commissioners being "freed from the control of many local governing bodies, who are frequently liable to nullify each others' action, entailing large expense upon the public with inadequate returns." Owing to the liberal authority given the Boston Metropolitan Park Commission, according to the secretary, that body "has now in hand, taken since the beginning of last winter, some 7,000 acres, included within three reservations, known as the Blue Hills reservations; about 4,000 acres south of the city in the towns of Canton and Milton and the city of Quincy; the Middlesex Fells reservation, in the cities of Malden and Medford, and the towns of Winchester, Stoneham, and Melrose, about 3,000 acres, besides the Beaver Brook reservation, Waltham, of 60 acres, containing remarkable oak trees of a thousand years' growth." The Boston Park commission has also taken in hand the work of restoring and preserving the beautiful Revere Beach, along the shores of Nahant or Lynn Bay, and the laying out of numerous attractive boulevards, all immediately accessible from the city.

Cut and Wire Nails.

To obtain some figures which would give not only the maximum force, but also the work required both for driving and pulling various nails, experiments were lately conducted in the laboratory of Sibley College, at the instance of R. C. Carpenter. Nails of various kinds were forced into a piece of Southern pine, which was as nearly homogeneous as was possible to obtain.

In making experiments it was noticed that the cut nail bruised and broke the fibers of the wood, principally at the end of the nail, whereas the wire nail simply crowded them apart, and probably did not move them much beyond the point from which they would return by elastic force, and hence the nail would be grasped much stronger per unit of area of surface by the wood. Presenting less surface, there would be, however, less resistance to starting.

To see what the effect of change of form would be, a number of tenpenny cut nails were sharpened on the point by grinding to an angle of about thirty degrees, so that the fibers in advance of the nail would be thrust aside, and not bruised and broken. This served to increase the holding power, as will be seen by the experiment, over the cut nail of ordinary shape, about fifty per cent in starting force, and about thirty per cent in work of resistance to pulling.

OPENING OF THE NEW PORT OF BIZERTE—THE CRUISER SUCHET TRAVERSING THE NEW SHIP CANAL.

© 1895 SCIENTIFIC AMERICAN, INC.

Food and Drink for the Sick.

In acute inflammatory rheumatism, meat in any form is to be avoided, while fruit, green vegetables, gruels, and vegetable soups are likely to prove beneficial. Hysterical subjects need a generous meat diet, and should avoid spirituous and fermented liquors. Consumptives require a liberal diet, and should partake freely of substances rich in fat, as meats and preparations of cream or milk. In diabetes, the diet should be highly nourishing and varied, and should include all meats—excepting liver—and vegetables not rich in starch or sugar; while all starchy and saccharine foods, malt liquors and wines are to be avoided. In diseases of the heart a dry, nourishing diet is most conducive to the comfort of the invalid, as liquids are absorbed slowly; the table should be generous, but stimulants and strong coffee should be excluded, as they readily excite the heart's action.

Before presenting the various receipts and formulas available for preparing special varieties of food and drink for the sick and infirm, we would call attention to the fact that so-called "dieting" can easily be carried to extremes, and that due nourishment may thus be withheld from bodies and organs in which vitality is running low. Referring to this subject, the late Prof. Gross, of Philadelphia—to whose utterances the weight of authority has always been accorded—once said:

"The diet of the sick room has slain its thousands and tens of thousands. Broths, and slops, and jellies, and custards, and ptisans are usually as disgusting as they are pernicious. Men worn out by disease and injury must have nutritious and concentrated food. The ordinary preparations for the sick are, in general, not only not nutritious, but insipid and flatulent. Animal soups are among the most efficient supporters of the exhausted system, and every medical man should know how to give directions for their preparation. The life of a man is his food. Solid articles are, of course, withheld in acute diseases in the earlier stages; but when the patient begins to convalesce, they are frequently borne with impunity, and greatly promote recovery. All animal soups should be made of lean meat, and their nutritious properties, as well as their flavor, may be much increased by the addition of some vegetable substances, as rice or barley."

The following rules, suggested by Dr. Napheys, should always be observed in preparing, cooking, and serving food for the sick:

All the utensils employed should be scrupulously clean. Never make a large quantity of one thing at a time. Serve everything in as tempting and elegant a form as possible. Put only a small quantity of an article on a dish at a time. Keep milk and other delicacies on ice in warm weather. Never leave food about a sick room. Prevent, as far as possible, the odor of food in process of preparation from reaching the sick room. Never offer beef tea or broth with the smallest particle of fat or grease on it, nor milk that is sour, nor meat or soup that is turned, nor an egg that is bad, nor vegetables that are underdone.

Milk is justly held in high esteem as an article of diet for the sick. As a rule, it is agreeable to the palate and easy of digestion; still, in order to insure its highest usefulness, due management is necessary. A simple fresh milk diet is not only monotonous, but frequently occasions trouble. Biliousness may ensue and gastric and intestinal irritation supervene; while the purity and innocuousness of fresh cow's milk may many times be questioned. Only milk recently drawn from the udder should be used in the sick room, and, on the score of safety, this should be boiled as soon as received and set in a cool place. As a nourishing beverage, this boiled milk may be served either cold or lukewarm, and for weak stomachs may be greatly improved by the addition—when administered—of an equal quantity of carbonated water.

Milk Gruel.—Scald one-half pint of milk, add six raisins, and allow to stand five minutes. Take a tablespoonful of cornstarch and thoroughly mix with two tablespoonfuls of cold milk. Having placed the scalded milk in a farina boiler over the fire, add the cold milk and cornstarch, stirring the whole backward and forward until it begins to thicken; then add one ounce of sugar and let it cook one minute. Strain, and place in moulds in a cool place.

Milk Gruel with Oatmeal.—Fine oatmeal, two tablespoonfuls; milk, one pint. Stir the oatmeal smoothly into the milk. Then stir it quickly into a pint of boiling water and boil a few minutes until thickened. Add a pinch of salt and sweeten with sugar.

Milk Jelly.—As a variation in milk diet, the following is recommended: Heat one quart of milk with one pound of sugar, and, when the sugar is dissolved, continue the heat at a boiling temperature for about ten minutes. Then cool well and add, slowly stirring, a solution of one ounce of gelatine in a cupful of water. Next add the juice of three or four lemons. Pour into glasses and set in a cool place. It is necessary to have the milk quite cold before adding the other ingredients, else it will curdle.

Milk Punch.—Good brandy, one or two tablespoonfuls; cold milk, one tumblerful. Mix with sugar and nutmeg, to taste. This is a useful medicinal drink when a stimulant is required in conjunction with a nutrient.

Meats and Meat Preparations are usually conspicuous in the dietetics of the sick room. A large proportion of the animal food consumed by mankind is taken in the form of animal flesh or meat, preparations of which are most valuable for the nourishment of the sick.

Beef Tea.—This is best made by dissolving a proper amount of a reliable brand of "beef extract" in a cupful of boiling water, seasoning with salt, celery salt and a little pepper, and serving hot.

Beef Juice.—Broil quickly a thick piece of fresh beef devoid of fat and bone; put in a meat press and squeeze out the juice. Season and serve full strength or diluted with hot water.

Chicken Broth.—Skin and chop up a small chicken, or half a large fowl, and boil it, bones and all, with a blade of mace or sprig of parsley and a crust of bread, in a quart of water, for an hour, skimming it from time to time. Strain through a coarse colander.

Mutton Broth.—Lean loin of mutton, exclusive of bone, one pound; water, three pints. Boil gently till very tender, adding a little salt and onion, according to taste. Pour off the broth in a basin, and when it is cool skim off all the fat. It can be warmed up as wanted. If barley or rice is added, as is desirable during recovery from sickness, it should be boiled separately until quite soft and put in when the broth is heated for use.

Cutlet for Invalids.—One nice cutlet from the loin or neck of mutton: water, two teacupfuls; celery salt, a sufficient quantity, or one very small stick of green celery. Remove all fat from the cutlet and put in a stewpan with the other ingredients. When fresh celery is used it should be cut in thin slices before being added to the meat, and care must be taken not to add too much. Stew very gently for nearly two hours, adding salt and pepper to taste, and from time to time skim off every particle of fat that may rise to the surface. If the water is allowed to boil fast, the cutlet will be hard.

Eggs, as articles of diet, are cheap and nutritious; moreover, they are quite easily digested, if not damaged in cooking. An egg is rather complete food in itself—containing, as it does, everything required for the development of a perfect chick. An average egg weighs a thousand grains, and is more nourishing than an equal weight of beefsteak. For invalids, eggs should be soft boiled, or dropped from the shell into boiling water and served with crackers or toast.

Cup Custard.—One egg, one cup of milk, sugar, nutmeg, and salt to taste. Beat egg thoroughly in a teacup, add the milk and flavoring, mix and bake about twenty minutes in an oven moderately heated. May be served cold or warm, with or without jelly.

Drinks, properly prepared, are quite as important to the sick room as food. Especially during the summer season, and when suffering from febrile conditions, will the value and advantage of cooling and refrigerant drinks be appreciated, while mucilaginous demulcent fluids will be found soothing to irritable states of the alimentary canal and pulmonary and urinary systems.

Imperial Drink.—Dissolve from two to three drachms of cream of tartar in a quart of boiling water, add the juice of one lemon and a little lemon peel, and sweeten with sugar. When cold, it may be taken freely as a cooling drink and diuretic. A valuable drink in threatened sunstroke and passive congestion of the brain.

Lemonade.—Pare thinly the rind of a lemon and cut the lemon into slices. Put the peel and sliced lemon into a jug with an ounce of white sugar and pour over them one pint of boiling water. Cover the jug closely and digest until cold. Strain or pour off the liquid. Citron may be used instead of lemon, and likewise furnishes a grateful and refreshing refrigerant beverage.

Milk Lemonade.—Sugar, one and a half pounds, dissolved in a quart of boiling water, together with half a pint of lemon juice and one and a half pints of milk. This makes a cooling, agreeable, nourishing beverage.

Linseed Tea.—Place in a jug one ounce of bruised linseed, two drachms bruised licorice root, half ounce white sugar, and two tablespoonfuls of lemon juice, and pour over them one pint of boiling water. Cover lightly, and digest for three or four hours near a fire. Strain through linen before using. This makes a mucilaginous liquid possessing demulcent properties and of special value in bronchial and urinary affections.

Barley Water with White of Egg.—Take a tablespoonful of coarse barley and wash well with cold water, rejecting the washings. Then boil for an hour or more with a pint and a half of clean water, in a covered vessel or saucepan. Add a pinch of salt, enough sugar to render palatable, and strain. To four or six ounces of barley water thus prepared add the white of one egg. The value of this preparation in gastro-intestinal inflammation and irritation is not easily overestimated. In the enterocolitis of very young infants, its exclusive administration for thirty-six or forty-eight hours will often relieve when all other measures have failed.

When a patient cannot be raised from the bed without risk of exhaustion, a medicine tube or crockery feeder should be used, but the same appliance, or even one of the same appearance, should not be used for administering both food and medicine. The patient's mouth should be kept clean and fresh, as should also all external surroundings.—J. H. Egbert, M.D., in Dietetic and Hygienic Gazette.

Pineapple Cultivation in Florida.

The question is frequently asked us: "Can pineapples be successfully grown in Lake County?" We unhesitatingly answer, they can. Many are grown, but generally in small patches, here and there, of which little is known except to the individual growers; yet sufficient to demonstrate the adaptability of our soil, and showing that with the same treatment they require elsewhere success is equally certain. We give below a few facts concerning the plant and the mode of culture in the interior of the State.

Although the lower Indian River and Lake Worth region is the great pineapple district of Florida, yet there are other portions of the State where much attention is now being given to pineapple culture. In the vicinity of Orlando the industry has probably made the greatest advancement, although possessing no greater natural advantages than many other portions of South Florida. The best results are reached in this region by growing the plants under a grating cover, which affords protection from occasional frosts and strong winds, and shuts out some of the summer sunshine. The cover is made of narrow boards placed a few inches apart on stringers and supported by posts at an elevation sufficient to allow persons to walk upright under it. The sides of the sheds on the north and west are weather-boarded in order to further protect the plants from cold winds. The cost of such sheds varies from $300 to $500 per acre.

Near Orlando there are three large pineries—Russell's Fairview and Modela Park. The latter is the largest covered pineapple field in Florida, and probably the largest in the world. It contains six acres and about 60,000 plants.

Pineapples grown under cover average much larger in size and have a better flavor than those grown in plantations, and hence command a better price. They generally net the shipper from 15 to 30 cents each. Six thousand apples sold from the Fairview pinery last year brought $1,200. The suckers, however, produced by this pinery, which are in great demand for planting, were much more profitable, nearly $8,000 having been realized from their sale.

While the pineapple ripening season in the Indian River region is from April to September, in interior Florida it is not strictly confined to these months, as, under cover, the flowering, and hence the fruiting of the plant, can be to some extent controlled. There is hardly a month in the year when ripe apples cannot be picked from the covered pineries. Grounds bordering lakes are favorite pinery sites. The plant requires frequent fertilizing to insure good and large fruit. Cottonseed meal is considered one of the best fertilizers for pineapple plants.

A few facts concerning the pineapple plant botanically considered may add interest to this article. Not many years ago many people who had not studied the subject thought that it was a parasite growing on pine trees, and that the fruit was grown in its aerial position. This idea may be accounted for by the fact that the fruit resembles the pine cone (it was so named from this resemblance), that the pineapple belongs to the botanical family Bromillaceae, of which the long moss is a member, and that botanists say that all plants of this family are capable of "living on air alone." The pineapple plant has long, serrated, sharp-pointed, rigid leaves, springing from the root of the plant, and from the center of the leaf cluster a short flower stalk growth, bearing a single spike of flowers and a single fruit. In the development of the fruit each flower and the bract accompanying it become thickened and fleshy, and this causes a crowding or growing together of the mass, forming a single fruit covered with berry-like projections—the withered tips of the remaining petals. It is these petal tips that give the fruit the appearance of being covered with eyes. The plant grows to the height of from three to five feet.—Am. Jour. Pharm.

Utilization of Salt Water.

The cable power plant of the Sutter Street Railway, in San Francisco, probably gets its condensing water from a greater distance than any other street railway plant in the world. The water is piped five miles from the ocean to the power plant. After use in the condenser, it is piped to the Lurline baths near by, at a temperature of 100 degrees Fahrenheit. The piping of the water is done by the Olympic Salt Water Company, and the Sutter Street Railway pays for its use in the condensers.

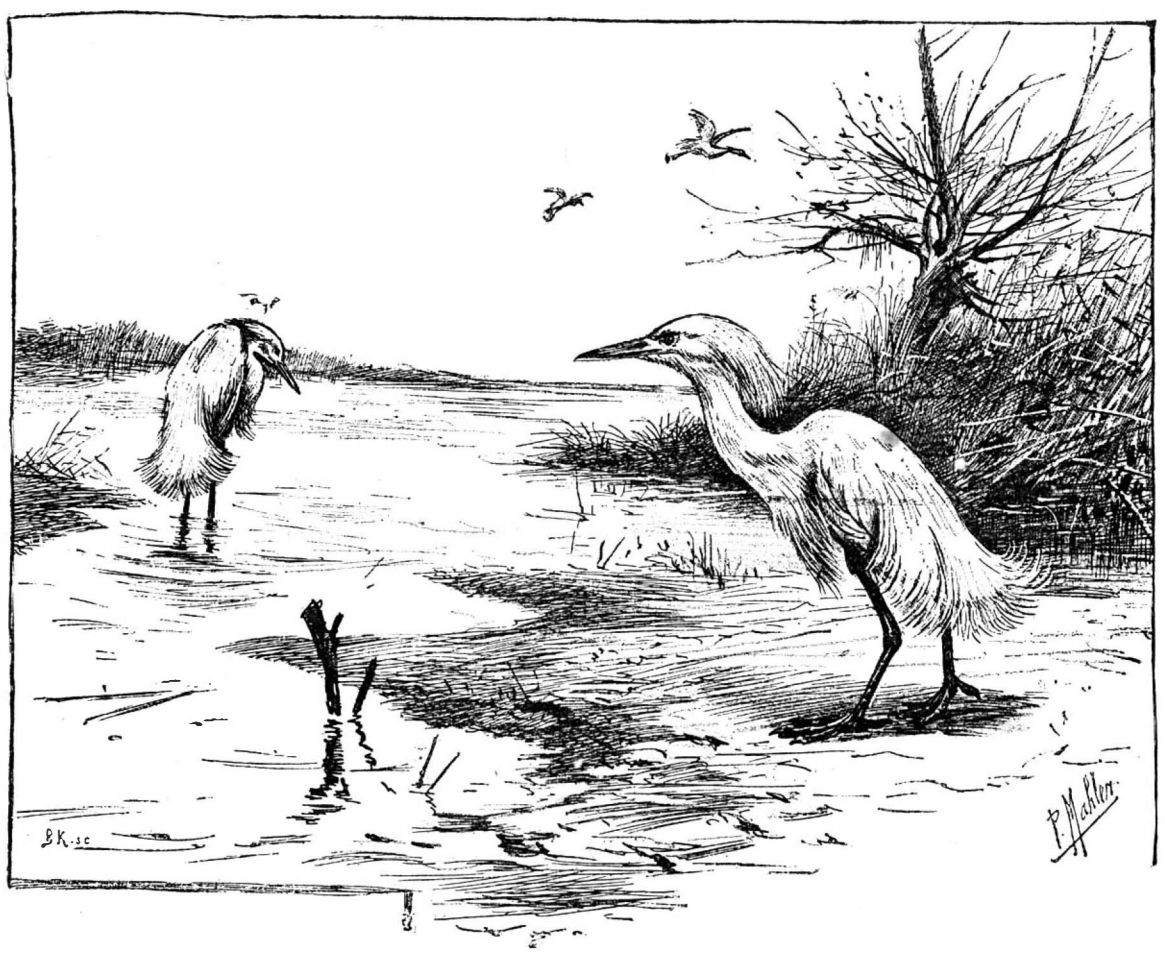
The daily output is 300,000 gallons. The arrangement is one mutually agreeable to the street railway and salt water company, and may be a suggestion of what can be done elsewhere.

© 1895 SCIENTIFIC AMERICAN, INC.

THE HERON.

The neron is a wading bird of the family Ardeidae and the old genus Ardea (Linn.), including also the bitterns and egrets. The food of the heron consists largely of fish and reptiles, but it will eat small mammalia such as mice and even water rats. There was found in the stomach of one of these birds seven small trout, a mouse and a thrush. Eels are also a favorite food with the heron, but on account of their long, lithe bodies they are usually taken to shore and killed by pounding on the rocks or the ground. The heron is able to disgorge its food, and when pursued by birds of prey often resorts to this measure. When looking for food the heron usually stands in shallow water, where it remains immovable for a long time, but when it sees a fish or other kind of food it strikes it with its sharp bill. When attacked the heron instinctively aims at the eye of its adversary. Even a game cock has difficulty in protecting itself from the heron. The beak of this bird is sometimes set on the end of a stick and used as a spear. The body is rather compressed; the neck is very long and is well feathered. The wings and legs are long. The serrated middle claw is for removing from the bill the sticky down which is apt to adhere to it after cleaning the plumage. The nest is almost always built upon some elevated spot, as the top of a large tree or on rocks near the coast. It is a large and clumsy looking nest made of sticks and lined with wool. The nests are clustered near together for mutual protection. The eggs are from four to five in number and are of a pale green. The heron itself is gray running into black and the plume is dark slaty blue. The total length of the bird is about three feet.

The heron is widely distributed. The Louisiana heron is called by Audubon the "Lady of the Waters." The American varieties of the heron are sometimes seen as far north as Massachusetts. The heron was once one of the commonest English birds, but on account of the drainage of the swamps it is now seldom seen except in localities where the conditions are such that the birds can flourish. For our engravgraving we are indebted to Le Naturaliste.



THE HERON.

Railway Enterprise in Egypt.

Consul Penfield, United States consul at Cairo, in a report to the State Department, remarks as follows: It is said that Egypt, in proportion to population, has more railway mileage and better service than Austria-Hungary, Spain or Portugal. All railways are government property, with the exception of a short suburban road from Alexandria along the Mediterranean to Ramleh, a 15 mile line connecting Cairo with the health resort of Helouan, and a steam tramway on the bank of the Suez Canal, joining Port Said with Ismailia. These private enterprises, as well as the government lines, are very profitable. The income of the latter is pledged to certain European creditors of the country, as a partial consequence of the extravagance of Khedive Ismail.

A network of rails spreads over most of the delta, and the main line has for two or three years extended southward in the Nile valley to Girgeh, 336 miles from Cairo. Two years hence, the road will be completed to Keneh, 66 miles further south; and contracts have just been signed for carrying it to Assouan, the frontier town of Egypt, at the first cataract of the Nile, and 710 miles from the Mediterranean. This terminus is expected to be reached in time for the Upper Nile tourist traffic of 1897-98.

The moderate speed at which all trains are driven, save the expresses, and the cheapness of native labor permit the working expenses to be kept much below the European average. A level country, with frosts and violent storms unknown, makes railway construction a simple matter. Rock blasting, tunneling, excavating, and trestle building are practically unnecessary.

GEN. MILES strongly advocates extending the use of the bicycle in the army. The Signal Corps is now making a good deal of the specialty of wheeling, and its use in this branch of the service is to be still further developed.

The Ether.

The old and fascinating problem concerning the manner in which the ether moves with or through matter has been attacked, says Nature, by Herr L. Zehnder, who contributes an interesting paper on the subject to Wiedemann's Annalen. He endeavored to decide whether the ether is pushed along by atoms or bodies, or whether it passes through them without resistance, or, finally, whether only a portion of the ether adheres to the particles of bodies, and this portion only is carried along. The apparatus used consisted of a cast iron cylinder in which a piston moved airtight. A narrow tube led out from one end of the cylinder, doubled back upon itself, and returned by the other end. Now, if the cylinder was exhausted of air, and the piston pushed the ether before it, the latter would stream through the narrow tube with a velocity greater than that of the piston in the ratio of the sectional areas of the cylinder and the tube. This ratio was 560, and exhaustion was carried to 1·40,000 of an atmosphere.

To test the motion of the ether, a beam from a brilliant sodium flame was passed through two thick parallel glass plates, the second one being silvered at the back. This plate, by its two reflecting surfaces, split the beam into two, each of which traveled through one portion of the narrow tube. The two beams, reflected near the cylinder by a rectangular prism, were recombined by the same thick plate and returned along the way they had traveled, being finally reflected into the reading telescope by the first plate. Interference fringes were thus produced in the field of view, the motion of which would have indicated a motion of the ether. But no such motion was observed when the tubes were thoroughly exhausted, so that it must be concluded that the ether passes freely through solid bodies. The corollary to this conclusion, that there is a relative motion between the earth and the luminiferous ether, though investigated by the author by means of a new and ingenious apparatus on the Rosskopf, near Freiburg, could not be proved.

The Theory of a Draw Cut.

A writer in the Railway Review thus explains why it is that a knife cuts better when drawn across the object to be cut:

"This matter of varying the angle of cut by varying the motion of the cutting tool is something that is learned almost instinctively in actual practice. The small boy very quickly comes to understand that his knife will cut better if he gives the blade a drawing motion while cutting. This is due to two reasons: One that the knife, even on the rare occasions when it is sharp, is microscopically a saw, and the drawing motion gives the teeth a chance to act; and the other that, as the drawing becomes more rapid, the cutting angle of the blade is made smaller and sharper, so that a rapid draw really gives a temporary sharpness to the instrument. These are trifling and elementary matters, but they will serve to emphasize what I have many a time urged upon young mechanics: the desirability, nay, the very necessity, of close observation of and speculation upon the reasons for the common phenomena of everyday life."

Coloring Photographs.

Hector Kraus thus describes a process recently patented in Germany. The pictures are colored from the back. The coloring permits the finest details, in regard to light and shade, while the brilliancy of the colors and the effects produced perfectly harmonize with the general tone of the photograph itself. The colors employed for this purpose are aniline colors, which are dissolved in water or alcohol, and the solution, which can be made either warm or cold, must be as concentrated as possible. Numerous experiments have shown that certain aniline colors, dissolved in water or pure alcohol, give the desired results, while other colors require a solution, in a mixture of alcohol and acetic acid, in order to be utilized for this purpose. The number of aniline colors which can be produced in this manner is, of course, unlimited. Those colors dissolved in alcohol, or in a mixture of alcohol and acetic acid, must be kept in well stoppered bottles, so that they keep as long as possible the capacity of penetrating into the paper or other material. In order to use the prepared colors, they must be diluted with a medium, consisting of pure alcohol, or alcohol mixed with acetic acid. This medium makes it possible for the artist to weaken the different colors more or less, and thus to produce darker or lighter tints; besides, it increases the penetrating capacity of the colors. The photographs, no matter on what paper or by what process they are made, are colored before they are mounted, without undergoing any previous preparations. It is only necessary that the print is flat, without creases or other defects. The print is placed on a retouching frame, or a similar apparatus, on which it can be seen by transmitted light, then the colors are applied with the brush, on the back of the print, and diluted with a certain quantity of the medium. It is only necessary to keep exactly the contours, or different outlines of the pictures. The colors possess an extraordinary penetrating capacity, and enter at once into the paper, for which they possess a great affinity. It is, therefore, very easy to control the progress of the work, and to apply the colors within the limits where they are necessary. The liquids which have served for the preparing of the colors evaporate very quickly, and only the coloring matter itself remains in the paper. By turning over the print it can be observed how the colors appear on the front, and it is possible to exactly judge the effect produced by the colors, and, if necessary, to strengthen them by the application of further tints. After the picture is colored to satisfaction, it can be mounted and burnished like any other photograph; small high lights and finishing touches, such as jewelry or other small details, can afterward be applied with ordinary body colors on the front side of the picture.—Photographisches Archiv., Photography.

An Electric Shock.

A curious accident occurred at Rochester, N. Y., June 20. Mr. Frank E. Grover, foreman of the Rochester Gas and Electric Company, who is employed at the power house at the lower falls, received a shock from the brushes of a series wound continuous current dynamo carrying its full complement of 60 series arc light street lamps. The electromotive force was thus nearly 3,000 volts. He was resuscitated after an hour and a quarter's hard work by a physician and three workmen. The men in the station had been made familiar with the D'Arsonval method, and they went to work at once to produce artificial respiration by raising and lowering the arms in rhythm and at the same time alternately pressing and releasing the chest. This was continued until a physician arrived. He ordered the treatment to be continued, though apparently the patient was dead. Shortly after Grover began to show signs of life and in a few minutes natural respiration set in and he soon was well enough to be sent home. The physician pronounces him out of danger. All agree he would have died had not artificial respiration been resorted to. There are many cases on record where death resulted from much less intense currents, while in some the voltage was as low as 500.

© 1895 SCIENTIFIC AMERICAN, INC.

Electrocution.

By the laws of the State of New York the gallows and hanging for the execution of criminals condemned to death are done away with and the instantaneous electric current is substituted. This method has been employed in New York State for the past four or five years, and is generally conceded to be a vast improvement upon the common hangman's operations. If anything connected with the forcible extinguishment of the life of a criminal can be designated as humane, then the electric process may be rightfully so classed.

The most recent case of electrocution is that of a murderer named Buchanan, who was executed at the Sing Sing prison on the 1st of July.

The New York Herald gives a graphic description of the scene, by Mr. W. J. O'Sullivan, from which we make the following abstracts:

In the case of Dr. Robert Buchanan, who was electrocuted yesterday, every one present was surprised on his entrance. Without the least evidence of fear or bravado he came leaning on the arm of a clergyman, walked to the death chair without the slightest indication of hesitancy, and after seating himself followed with his eyes the process of strapping his legs and arms. There was no tremor of the lips nor nervous twitchings of the hands. To all outer seeming he was calm, and was undoubtedly courageous.

After the strapping was completed, and the leather mask and cap arranged, one of the electrodes was strapped below the knee, the other being in the cap put on the head. At a sign from one of the officials the electrician turned on the electric current, a sudden powerful and intense tonic contraction of the entire muscular system was seen, the body straightened, the legs and arms contracted vigorously, the leather binding straps creaked loudly, the entire surface of the body below the base of the neck blanched, the arms and legs became apparently and were actually bloodless, and Dr. Buchanan was dead.

As much confusion seems to exist relative to the lethal effect of the electric current as employed in electrocutions in this State, it may be of interest to describe the mode of employing the electric force at these executions.

In Dr. Buchanan's case, the first shock was given by a current of 1,760 volts and 8½ amperes. This lasted for seven seconds, and the current was lowered to 200 volts for thirty seconds, then raised to 1,740 volts for three seconds, and again lowered to 200 volts for seventeen seconds, when the current was cut off, the whole time during which the current was employed being fifty-seven seconds.

After this current had been shut off, the prison physician, Dr. Irwin, and a very experienced physician, Dr. E. F. Sheehan, of Sing Sing, who has attended nearly all the electrocutions, examined the neck to discover if the carotid arteries gave any indications of pulsating. The body of the unfortunate man emitted two gurgling sounds, with an interval between them. The electrician was instructed to again pass the current through the body, which he did, sending 1,760 volts of 8½ amperes for three seconds, and lowering the current to 200 volts for twenty seconds, when the current was shut off entirely.

The body was then examined by nearly all the physicians present, to determine if the faintest heart beat could be detected, and the consensus of opinion was that life was extinct—as the writer verily believes it was. After this examination the body was placed on the autopsy table.

To many the terms volts and amperes convey but an indistinct idea of the potency of the agent used to induce death, and the haziness of this idea has been materially increased by horror mongers who have exploited themselves recently through the press, the most noticeable feature of their lucubrations being the absence of the elements knowledge or disinterestedness.

If the reader will regard the voltage as the speed or velocity of the current and the amperage as the mass or volume of this same current, he will glean through this imperfect parallel some idea of what is meant. It is strange that those who have discussed this matter in the daily papers either wittingly or unwittingly avoid mention of the amperage, without which no estimate can be formed of the potency of the current or its energy. A locomotive and a bee may travel at the same rate of speed, say twenty miles per hour. That speed would, in the case of electricity, be the voltage. Should a person come in collision with the bee little damage would ensue, though the obverse would be the fact in the case of the locomotive. Wherein lies the difference, both having the same speed or voltage? It lies in the volume of the mass or body of each. This would be the amperage in the case of electricity, and if we multiply the speed or velocity by the weight or volume of the mass or body, we get the striking force, or what is termed in the case of electricity a watt, which is defined as the unit of energy or working power.

Fearing the foregoing very simple facsimile may not be sufficiently lucid, we can measure this energy by a better and more accurate method. Taking the current employed on Dr. Buchanan, 1,760 volts, 8½ amperes. If we multiply the former by the latter, we have 1,760 ×8½—equal 14,960 watts. Now it has been demonstrated by electricians that 746 watts equal one horse power. If we divide 14,960 watts by 746 watts, we get the potency of the current employed to kill Dr. Buchanan as equal to 20 horse power. Such power suddenly liberated in a human body can have but one result—to kill. It did kill, the death being sudden and painless.

In relation to the two gurgling sounds emitted, and which have been and will be magnified and exaggerated by caterers to the morbid and grewsome, it will only be necessary to recall to the reader's mind the fact that death by electricity is by asphyxiation, or as it is more popularly known, by suffocation, a death similar in this respect to one from drowning or strangulation, etc.

Castelar on the Press.

When I take in my hands a newspaper, when I survey its columns, when I consider the variety of its matter and the richness of its news, I cannot help feeling a rapture of joy for my age and pity for those ages which did not know this prodigy of human intelligence—the most extraordinary of all its creations.

I can understand states of society without the steam engine, without the telegraph, without the thousand wonders which modern industry has sown in the triumphal way of progress, adorned by so many immortal monuments; but I cannot understand a state of society which is without that great book of the daily press in which are registered by a legion of writers, who ought to be consecrated to the people, our afflictions, our perplexities, our fears and the degrees of perfection which are approaching in the work of realizing an ideal of justice upon the face of the earth.

If one day there were called to judgment all the institutions in which people so much rejoice, and were exhibited, each carrying in one hand the good it had done and in the other the evil, perhaps none could rise so pure as the press, and none would merit a benediction more justly due from the human conscience.—Emilio Castelar, Los Angeles (Cal.) Record.

RECENTLY PATENTED INVENTIONS.

Engineering.

CUT-OFF VALVE.—Franz Markgraf, New York City. This invention covers a simple valve mechanism contained entirely in the steam chest with the main slide valve, with which it acts in unison, being automatically controlled by the same means that controls the flow of steam to the valve. The latter has an arched steam duct entered by an induction port at the top of the valve, there being an exhaust cavity between the lower ends of the duct, a spring-pressed cut-off valve covering the induction port, a cut-off valve actuating device moving it against the stress of the springs. There is ample provision for correct adjustment to secure a critical regulation of the cut-off, and thus effect an economical and automatic regulation of the supply of steam to the cylinder.

Railway Appliances.

CONDUIT ELECTRIC RAILWAY. — Edward Ebi, Cedar Rapids, Ia. This invention contemplates the use of an all-metallic circuit in an underground conduit, although, if desired, the return may be effected through the rails. The trolley comprises oppositely projecting and pivoted arms carrying the trolley wheels, there being toothed gearing between the inner ends of the arms and the lower end of a vertical rod, by turning which the arms may be raised or lowered to throw the wheels into or out of contact with the wires.

CAR FENDER.—Isaac Macowsky, New York City. Journaled in pedestals attached to the car bottom are shafts connected by gears with a fender and with a crank arm from which an operating lever extends up through the car platform, the fender being normally held a certain distance above the ground, but being moved downward to rolling contact with the rails by the motorman or gripman actuating a hand or foot lever. The improvement may be applied to any form of car without interfering with the brake mechanism, or with its cable or electrical appliances.

CLAW BAR.—Louis Trauth and William D. White, Gretna, La. This improvement comprises a heel readily attached to the ordinary claw bar to serve as a variable fulcrum having a firm bearing at its bottom, and enabling the claw bar by a continuous movement to readily withdraw a spike without bending it. The heel may also be adjusted to give increased leverage and withdraw the spike in two movements.

ROLLING STOCK FOR SINGLE RAIL TRAMWAYS.—Charles Ewing, Barrackpoor, India. This improvement contemplates the employment of track and traction wheels, the latter only on one side of the rail, the car frame overhanging on the other side, and the equilibrium of the car being obtained by the weight of the traction wheels and their fittings, or the leverage gained by the distance of the traction wheels from the rails. The cars may be built at a low cost, being especially designed for use on a cheaply built railway, and to retain a full load over a badly graded road, as a substitute for wagon transportation.

Miscellaneous.

BICYCLE DRIVING GEAR.—Dan G. Bolton, Cooperstown, N. Y. This a changeable gear, applicable to wheels of any make, which may be readily changed from high to low gear, or vice versa, while the wheel is in motion. It has a large sprocket wheel journaled on a small one, with a driving connection between the two wheels, there being a loose back plate on the larger wheel and a locking block moving radially on the plate engaging teeth on the inner side of the large wheel.

FOLDING BOAT.—John H. Rushton, Canton, N. Y. This boat has a solid bottom, canvas sides to the upper edges of which a gunwale is attached, and braced uprights hinged to the bottom supporting the gunwale. All parts of the framework and bottom are attached together, so that when folded the parts cannot get lost, and in setting up all the parts are easily brought to their proper position.

MACHINE FOR DEHAIRING FUR SKINS.—Conrad Schirmer, Brooklyn, N. Y. This machine provides for the use of two brushes in connection with a comb for separating the fur to expose the hair or bristles to be clipped by the shears, one of the brushes being a reciprocating brush operating in conjunction with the comb, while the other brush is held in stationary yet adjustable bearings, instead of being reciprocated, as in other machines of this character. The shears have a straight up and down cut, and may be readily brought into operation or rendered inactive as desired, while the feed for the skin being operated upon is automatic.

SUGAR MILL SHREDDER.—Cyprien Dube, Havana, Cuba. Combined with the endless conveyer and chute carrying the cane to the mill is a series of toothed disks on a shaft which act on the cane to reduce it to longitudinal shreds. A roller holds the cane down on the conveyer and prevents its escape from the action of the toothed disks, there being guards between the disks to prevent the carrying over of the cane. The improvement is designed to insure a more complete extraction of the juice and to economize power by putting the cane in the best condition for the most effective action of the rolls.

DEFECATOR.—Louis Amedee Roussel, Patterson, La. This improvement comprises a vertical scum delivery stand pipe in a pan, an adjustable funnel on the upper end of the pipe and a coil of pipe in the base of the pan, with means for heating the juice in the bottom of the pan with gradually diminishing heat from the outside of the vessel toward the center, to cause the scum to rise to the surface and float to the funnel. A pipe discharging through perforations at the level of the liquid in the pan forces the scum to the funnel, effecting perfect defecation without manual labor.

EVAPORATING PAN.—William S. Ballou, Bainbridge, Ga. This is an improvement in cooler and skimmer attachments for ordinary sirup boiling kettles. It is an apparatus to be applied to an ordinary kettle to enable the sirup to be rapidly boiled over a hot fire without attention, the sirup being moved over and over to and from the kettle, and being passed through a strainer and skimmer, so that it is effectually cleaned and only pure sirup left in the kettle.

CALIPERS.—George Harris, New York City. This instrument has sectional arms or legs pivoted at their upper ends to the opposite ends of a body section formed of curved or bowed central parts, with an adjusting device for regulating the movement of the body members toward and from each other, and the instrument having a micrometer adjustment.

PORTABLE STRUCTURE.—Laurence Nolan, New York City. This is a foldable frame adapted for supporting shelves or other purposes. It has pairs of legs pivoted at their middle and pivoted jointed arms connecting them at this point, pivot bolts passing through the upper ends of the legs of each pair, and stirrups pivoted on the bolts to adapt them for attachment to a bar.

HAME FASTENER.—John N. Goodall, Portsmouth, N. H. This device comprises a slotted barrel through which extends a screw having right and left threads, nuts carried by the screw projecting through the slot and hooks on the nuts engaging the eyes of the hames. The device is intended to take the place of the ordinary strap and buckle, may be readily applied to the hames to clamp its two ends together and adjusted by simply turning a thumb piece.

SASH SUPPORT AND LOCK.—William W. Dwigans, Arkadelphia, Ark. This improvement comprises a curved pocket near the lower end of the side bar of the sash, and a number of curved pockets in the bead strip, push pieces entering the pockets and projecting out through the bead strip, while a ball between the sash and bead strip is adapted to enter the pockets. The device effectively supports the sashes at different points of elevation and automatically locks the window in closed adjustment.

WASHING MACHINE.—Levi B. Pettit, Bridgeton, N. J. This machine consists of a tub in which is a semi-cylindrical rubbing board, and the cover of the tub has a central ball socket through which projects the shank or handle of a rubber, the clothes placed on the board being rubbed by moving the handle back and forth. On the tub bottom is a sliding rack which may be pulled out to afford a support for clothes before or after they are washed.

CORD FASTENER FOR ENVELOPES.—Malcolm Scougale, Fort Worth, Texas. For securing a cord on a merchandise envelope or like package, this invention provides means for permanently holding one end of the cord and temporarily securing the free end when desired. The device comprises a pair of opposed apertured disks, the outer one convex on its outer surface, and a head above it on a shank extending through the disks. The shank proper as well as the head is of two thicknesses, the cord being securely held by forcing it between the members of the shank.

TOOTH BRUSH. — James W. Dennis, Cincinnati, Ohio. The brush, according to this invention, is so connected with the handle that it may be carried to various positions, and when placed at an angle will be some distance removed from the handle. The improvement provides a universal joint or connection whereby a head may be attached to the handle to receive heads of different brushes.

BASKET. — Lewis Bennett, Schuyler, N. Y. This is a strong and light basket, which may be cheaply made, and is more especially designed for use on farms. It is made of a single piece of sheet metal pressed or stamped into form, and having at its upper edge a hollow rim, filled by a wooden strip, while its curved sides are provided with a series of annular encircling folds.

ADVERTISING SIGN.—Joseph P. Pappin, Brooklyn, N. Y. To serve as bulletin boards, to be set temporarily on the sidewalk in front of stores, etc., this inventor has devised a simple construction, not liable to be upset by the wind, and which may be conveniently folded to store the sign in a small space. It consists of two hinged frames covered by sign sheets made of a single piece of sheet metal, the connecting or top portion of which forms a hood for the upper jointed ends of the frames, and forms also a spring for closing the frames.

MATCH BOX AND CIGAR CUTTER.—Isaac L. Townsend and John Conway, Perry, Iowa. In this box the matches are so placed that by the pressure of a button a match is delivered, and when it is withdrawn it is also lighted. In a compartment at one end of the box is also arranged a knife or cutter, moving beneath apertures in which a cigar tip may be placed, and adapted, on the pressure of a button, to cut off the cigar tip at the same time that the match is pushed out.

SAFETY PIN.--Ephraim B. Lee, Weston, Mich. This is a pin made of a single piece of spring wire, and adapted to be easily locked and unlocked when placed in or removed from the goods. Its tension and operation are such that when the pin is removed from its sheath it does not fly outward, but always remains under cover or in close proximity to a shoe, constituting a lock which protects its point.

LADIES' HAT OR HAIR PIN. — Paul Jeanne, Greenville, N. J. This is an ornamental pin having a movable part arranged to readily change its position on the slightest movement of the wearer's head The invention comprises a casing carrying a vertical shaft, and a sleeve removably connected with a supporting bar or pin carrying an ornament, the shaft locking the sleeve to the bar or pin. The turning of the shaft and ornament at each motion greatly heightens the effect and appearance of the device.

Designs.

PLATEAU FRAME.—Philip F. Schaefer, New York City. This is a low round stand whose supports each consist of an animal's head and leg, in foliated ornamental work, the body being surmounted by a border comprising a band and a series of small figures.

TOBACCO PIPE.—Pearsall B. Jackson, New York City. In this pipe the stem, at the portion adjacent to the bowl, represents an athlete's shoe and stocking, as if on a foot and leg, the bowl rising from the instep and ornamented to simulate a football.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

© 1895 SCIENTIFIC AMERICAN, INC.

NEW BOOKS AND PUBLICATIONS.

AANSTAD'S FINANCIER'S LEDGER. A new system of keeping accounts with members of benficiary societies. By Ole O. Aanstad, Eau Claire, Wis.

This is a copyrighted book, sold at $5, $6, or $7, ruled for a specially devised form of keeping assessments, dues, etc., of benevolent associations, lodges, etc. The author has had long experience with such societies as financier and bookkeeper, and the system he has perfected is designed to insure entire accuracy, be very convenient, and easily learned from the instructions and practical illustrations given in its first pages.

GESCHICHTE DER EXPLOSIVSTOFFE. Von S. J. von Romocki. I. Geschichte der Sprengstoffchemie, der Sprengtechnik und des Torpedowesens bis zum Beginn der neuesten Zeit. Berlin: Robert Oppenheim (Gustav Schmidt). 1895. Pp. 395. 8vo, illustrated. Price 12 marks.

A very curious and interesting work on the history of explosives and the torpedo. The book has a number of reproductions of rare old engravings and contains copious annotations and references to classical and medieval writers. It is the first volume of a series which will take the work up to the present time.

REPORT OF THE AMERICAN HUMANE ASSOCIATION ON VIVISECTION AND DISSECTION IN SCHOOLS. Chicago. 1895. Pp. 64. 16mo, pamphlet.

This booklet contains some startling facts regarding vivisection in schools. The statement that any such practice really existed met at first with general incredulity. Even if vivisection were rarely done, it seems almost improbable that children of public school age should be required to become familiar with the process of mutilation and the phenomena of death. The value of vivisection in medical schools must be admitted, but its use in ordinary schools cannot be condemned too strongly. The pamphlet contains the opinions of such well known people as D. G. Brinton, W. D. Howells, Dr. Morgan Dix, Cardinal Gibbons, W. W. Story and others.

THE POCKET GOPHERS OF THE UNITED STATES. By Vernon Bailey. Washington: Bulletin No. 5 United States Department of Agriculture, Division of Ornithology and Mammology. 1895. Pp. 47. 8vo, pamphlet, plate, map.

LA THERAPEUTIQUE DES TISSUS. Compendium des medications par les Extraits d'Organes animaux. By Dr. M. Bra. Paris: J. Rothschild. 1895. Pp. 624. 8vo, 72 engravings.

A work on medication by means of animal organic extracts according to the method of the late Dr. Brown-Sequard.

L'INDUSTRIE CHIMIQUE. By A. Haller. Paris: J. B. Baillière et Fils. 1895. Pp. 346, 16mo.

This work is a reprint of Mr. Haller's report on the chemical and pharmaceutical products exhibited at the Columbian Exposition of 1893. It contains many out of the way facts about the manufacture and use of the rarer chemicals, essential oils, and other pharmaceutical products. The work is freely illustrated with graphic symbols.

CHURCHES AND CHAPELS. Designs and suggestions for church building committees, architects and builders. By F. E. Kidder, Ph.D., architect. New York: William T. Comstock. 1895. Oblong octavo, cloth. Pp. 55, 52 illustrations. Price $1.50.

In this work the author has chosen a subject that has not been written upon for a number of years, and we believe this is the only book of its kind treating on modern church building. We believe the book will be found very useful to architects. Church building committees will find the floor plans of great assistance in deciding upon the best arrangement for their especial needs. Nineteen designs, illustrated by forty-six drawings and half tones, and embracing almost every approved arrangement for modern churches, are given, and the larger proportion of the designs have been executed from the author's plans. Besides these designs the author has given much practical information on the construction and roofing of churches, planning and seating, windows, bells, etc., and several pages on acoustics, heating, and ventilation.

SCREW PROPELLERS AND MARINE PROPULSION. By I. McKim Chase, M.E. New York: John Wiley & Sons. 1895. Pp. 223, xxxi. 8vo, plates, tables. Cloth. Price $3.

The author commenced the preparation of this treatise with a view to supply a want that he had found existing among workmen who are engaged in building propelling screws. His purpose was to place before them a comprehensive and practical work that should elucidate the principles of screw propellers, the manner of their generation and their peculiarities, and explain the various methods employed in their construction. The section devoted to marine propulsion is also valuable.

THE WATCH ADJUSTER'S MANUAL. Being a practical guide for the watch and chronometer adjuster in making, springing, timing, and adjusting for isochronism, positions and temperatures. By Charles Edgar Fritts. New York: Charles E. Fritts, 307 West Twelfth Street. 1894. Pp. 364. 56 illustrations. 8vo. Cloth. Price $3.50.

This valuable book is written by an horological expert who has written a great deal for the watch trade journals under the nom de plume of "Excelsior." The germ of the present work was a book published in 1876 under the title of "A Practical Treatise on the Balance Spring." The author has greatly enlarged that work, so as to include such subjects as the demagnetization of watches. It treats of the making of balance springs, watch balances, springing and timing, special and natural compensations, the adjustment for isochronism, the adjustment for positions, heat and cold. The effect of modern watch manufacture is to tend to dispense with the services of watch repairers. If things go on in the same way, the time will come when the adjustments and the finer branches of work will be about all that is left of the trade worth having.

COLOR IN THE KINDERGARTEN. By Milton Bradley. Springfield, Mass.: The Milton Bradley Company. Pp. 57. 12mo, illustrated. Price 25 cents.

COLOR IN THE SCHOOL ROOM. A manual for teachers. By Milton Bradley. Springfield, Mass.: The Milton Bradley Company. Pp. 107. 12mo, samples of colored papers bound in. Price $1.

ELEMENTARY COLOR. By Milton Bradley. Pp. 128. 12mo, 64 illustrations, colored plate. Price 75 cents.

Froebel made no mistake when he included color as a part of the first material used in his system of elementary education. When the author of the series of books noted above began many years ago to manufacture kindergarten material, he found it impossible to match different lots of colored papers. There were no generally accepted standards of color, and every manufacturer made paper to suit himself; this led him to study the problem of a simple nomenclature for the standard colors and also to attempt experiments which would permit of supplying uniform educational material. The system presented in this series of books is based on the well known principle of the Maxwell wheel, originated by the late J. Clerk Maxwell; some valuable improvements were introduced in this device. The Bradley system of color instruction both for the kindergarten and primary school is fully outlined in these three books, which are freely illustrated with engravings, charts and samples of the Bradley papers.

☞ Any of the above books may be purchased through this office. Send for new book catalogue just published. MUNN & Co., 361 Broadway, New York.

SCIENTIFIC AMERICAN

BUILDING EDITION.

JULY, 1895.—(No. 117.)

TABLE OF CONTENTS.

1. An elegant plate in colors showing a residence at Bridgeport, Conn., recently erected for Christian M. Newman, Esq. Three perspective elevations and floor plans. Cost $5,500 complete. Architect, Mr. Samuel D. P. Williams, Williamsburg, N. Y.
2. A handsome residence at Glenwood, N. Y., recently erected for Wm. R. Innis, Esq. Two perspective elevations and floor plans. An attractive design.
3. A modern cottage of attractive design recently erected at New Rochelle, N. Y. Perspective elevation and floor plans. Estimated cost $3,000. Architect, C. B. J. Snyder, New York City. Design in the American order of architecture.
4. A summer cottage at Great Diamond Island, Me., recently erected for Edward L. Goding, Esq. Two perspective elevations and floor plans. Cost $2,500 complete. A picturesque design. Mr. A. Dorticos, architect.
5. An attractive dwelling at Oakwood, Staten Island, recently erected for Mrs. Margaret Dutche. Cost $3,800 complete. Two perspective elevations and floor plans. Architect, Mr. Herman Fritz, Jr., Passaic, N. J.
6. A Colonial dwelling at Springfield, Mass., erected for Messrs. J. D. and W. H. McKnight, at a cost of $6,000 complete. Two perspective elevations and floor plans. A pleasing design. Architect, Mr. G. Wood Taylor, Boston, Mass.
7. Colonial house recently erected at Groton, Mass., in the style of Longfellow's home. Perspective elevation and floor plans. Architects, Messrs. Child & De Goll, New York.
8. View of the Hotel Majestic, New York. One of the finest hotels in the world. Architect, Mr. Jacob Rothschild.
9. A cottage in the Colonial style, recently erected for Margaret Deland at Kennebunkport, Me. A picturesque design. Perspective elevation and floor plans. Mr. Henry P. Clark, Boston, Mass., architect.
10. Suggestions in corner decorations.
11. Miscellaneous contents: Hoop poles.—How to drive rats away alive.—Dumbwaiters and elevators, illustrated. — Saws. — Translucent fabric.—Improved spring hinges, illustrated.—Ventilated school wardrobes, illustrated.—Hanger for storm sash and screens, illustrated.—The hygienic refrigerator, illustrated.—Improved door hangers, illustrated.—Improved steam heater, illustrated. — Concrete roofs.—A trackless sliding door hanger, illustrated.—A first class hot water heater, illustrated.

The Scientific American Building Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates and fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural Publication in the world. Sold by all newsdealers. MUNN & CO., PUBLISHERS, 361 Broadway, New York.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

The Maher & Grosh knives *cut*. Try them. See p. 31.

"U. S." metal polish. Indianapolis. Samples free.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Best Handle Mach'y. Trevor Mfg. Co., Lockport, N. Y.

Wanted—Fine book printing done for a reasonable price. N. Manius, Jefferson City, Mo.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

We want to have manufactured on large scale a household novelty. Galvanized, malleable, or gray iron. Dixie Novelty Co., Ltd., New Orleans, La.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

Wanted—A partner with capital, $7,000, to invest in the manufacture and introduction of a registering lumber measure, covered by two patents. No mechanical ability necessary or personal attention required unless so desired. Particulars and references furnished upon application to George Krueger, Johnstown, Pa.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(6567) B. J. C. asks for a formula for violet copying ink. A. For blue violet, dissolve in 300 parts boiling water methyl violet 5B, Hofmann violet 3B, or gentiana violet B. For reddish violet, dissolve in a similar quantity of water methyl violet BR. A small quantity of sugar added to these inks improves their copying qualities. If the writing, when dry, retains a bronzy appearance, more water must be added.

(6568) W. A. J. asks how to weld tortoise shell. A. Small pieces of good tortoise shell may be joined so as to form one large apparently seamless piece in the following manner: Slope off the margins of the shells for a distance of about ¼ of an inch from the edge. Then place them so that the margins overlap one another; and thus arranged put them in an iron press and immerse in boiling water for some time. The pieces by this means become so perfectly united that the joint cannot be seen. The filings and very small scraps may be softened in hot water and consolidated by hydraulic pressure in metal moulds. Protracted heating of tortoise shell darkens it, and greatly lessens its beauty.

(6569) R. A. McE. says: Can you give the formula for Luning's colorless varnish? A. Dissolve 2½ ounces of shellac in 1 pint 90 per cent alcohol, boil a few minutes with 5 ounces of well burnt and recently heated animal charcoal. A small portion of the solution should then be filtered, and if not colorless, more charcoal must be added. When all color is removed press the liquor through a piece of silk, and afterward filter through fine blotting paper. This kind of varnish should be used in a room at least 60° Fah., perfectly free from dust. It dries in a few minutes, and is not liable afterward to chill or bloom. It is particularly applicable to drawings and prints that have been sized and may be advantageously used upon oil paintings which are thoroughly hard and dry, as it brings out the colors with the purest effect. This quality prevents it from obscuring gilding, and renders it a valuable varnish for all kinds of leather, as it does not yield to the warmth of the hand and resists damp, which subjects leather to mildew. Its useful applications are very numerous, indeed to all the purposes of the best hard spirit varnish.

(6570) C. H. M. says: Please state through your paper what is the best cement for fastening rubber to smooth iron surfaces. A. Powdered shellac is softened in ten times its weight of strong water of ammonia, whereby a transparent mass is obtained, which becomes fluid after keeping some little time without the use of hot water. In three or four weeks the mixture is perfectly liquid, and, when applied, it will be found to soften the rubber. As soon as the ammonia evaporates the rubber hardens again—it is said, quite firmly—and thus becomes impervious both to gases and to liquids. For cementing sheet rubber, or rubber material in any shape, to metal, glass, and other smooth surfaces, the cement is highly recommended.

(6571) R. J. C. says: Can you inform me how to restore crushed and bent feathers, also directions for cleansing them? A. To restore when feathers are bent and out of curl, they should be exposed to steam, or else put in boiling water for one minute, when they should be taken out and laid in temperate water for some time. For directions for cleaning feathers see our "Scientific American Cyclopedia of Receipts, Notes and Queries."

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

July 2, 1895,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising device, J. F. Bomm 541,915
Aerial navigation, E. C. De los Olivos 542,100
Agricultural implements, swinging seat for, L. Beyer, Jr. 542,133
Air compressor, W. Moyer 541,979
Album, support, photographic, G. Schwab 542,113
Amido base and colors therefrom, new, R. Koreff 541,859
Annunciator, train, C. H. Rittenhouse 542,108
Arm support, H. T. Loomis 541,863
Autographic register, G. M. Morris 542,091
Automatic sprinkler, Turner & Gardner 542,122
Axle lubricator, car, A. W. Wright 542,214
Band cutter and feeder, W. T. Flickinger 542,155
Banjo, W. F. Libby 542,165
Banjo, N. Merrill 541,976
Basin waste stop, H. J. Gilcher 541,845
Bath cabinet, portable, J. H. Kochenderfer 542,163
Bathtub fixture, J. H. Gavin 541,843
Battery. See Galvanic battery.
Bearing, shaft, W. H. Torstrick 541,902
Bed, spring, Bacon & Duvall 542,008
Bed, spring, A. L. Norton 542,170
Bed, spring, J. H. O'Connor 541,873
Bell, call, Evans & Tomkin 541,926
Berth, sleeping car, W. D. Downs 542,226
Bicycle case, N. W. Mumford 542,096
Bicycle support, S. Pennington et al 541,880
Bill holder, W. J. Whitwood 542,125
Boiler. See Steam boiler. Tubulous boiler.
Boiler, Bentzen & Olsen 541,830
Boiler, O. C. Davis 541,839
Boiler furnace, A. Dwelle 542,187
Bolting cloth brush, Mowson & Corey 542,093
Book, stamp holding, A. L. Brinckle 541,833
Books, machine for applying binding strips to, A. L. Garver 542,156
Boot or shoe, J. F. Sharpe 542,175
Bottle stoppling machine, F. B. Thatcher 541,898
Bottle support, H. T. Loomis 541,864
Bottle valve stopper, M. A. Skall 542,068
Bougie, anal, F. P. Stukey 542,177
Bracket. See Curtain roller bracket.
Brake. See Car brake. Railway brak. Wagon brake.
Brake lever, W. H. Masterman 542,088
Bridge gate, A. Lesna 541,860
Bridge gate, F. Rausch 541,881
Bridle, J. G. Shafto 541,950
Brushes, method of and apparatus for making, P. J. Kane 541,973
Bucket, well, E. J. Gilpin 541,846
Bucket, well, W. H. Tilford 542,120
Buildings, construction of, J. C. Pelton, Jr. 542,203
Buildings, construction of, J. C. Pelton 542,204
Camera. See Magazine camera.
Can capping machine, C. M. Kruse 542,198
Cannon valve, pneumatic, M. W. Sewall 542,174
Car attachment, street, J. W. Barnes 542,037
Car brake, W. H. Masterman 542,089
Car brake, railway, W. Main 541,866
Car brake, railway, R. L. Omensetter 541,983
Car coupling, E. R. Brown 542,141
Car coupling, J. B. Campbell 541,962
Car coupling, E. B. Griffin 541,968
Car coupling, A. F. Street 542,117
Car coupling, W. C. Watson 541,907
Car door movement, street, J. A. Tackaberry 542,069
Car draught rigging, railway, J. A. Roosevelt 542,110
Car fender, street, G. Berkley 541,914
Car fender, street, P. R. & M. F. X. Foley 542,047
Car operating mechanism, dumping, W. McMahon 541,981
Car ventilating apparatus, C. F. Hirt 542,018
Cars, means for utilizing air cushions on railway, L. F. Ruth 542,112
Cars, storage heater for street, J. F. McElroy 541,871
Carpet sweeper, S. H. Raymond 542,207
Cartridge, blasting, G. M. Peters 542,102
Cartridge case, Butterfield & Batchelor 542,041
Cartridge case for charging blast holes, Elliott & Carrington 542,154
Cartridges, closing disk for blasting, G. M. Peters 542,101
Cartridges, making blasting, G. M. Peters 542,103
Case. See Bicycle case. Cartridge case. Check case.
Cash register and indicator, F. H. Seymour 541,885
Check case, E. A. Glaeser 542,014
Check pad, H. G. Woolworth 542,128
Churn, I. Babbitt 541,821
Churn, W. W. Brigg 541,917
Churn, J. M. Critcher et al 541,837
Churn, S. D. Palmer 541,877, 541,944, 541,945
Churn, metallic, S. D. Palmer 542,026
Cistern, cement, T. F. Whiteside 541,987
Cistern, well, or tank cleaner, W. A. Latham 541,937
Clamp. See Hose shut-off clamp.
Clamp, J. G. Emery, Jr. 541,925
Clay, preparing, P. L. Simpson 541,888
Clothes drier, M. C. Burr 542,040
Clutch driving device for motors, J. Charter 542,042
Clutch specially adapted for cable driving pulleys, Calloch & Delcroix 542,143
Coal, system for handling, J. Campbell 542,077
Cock, gage, C. A. G. Winther 542,126
Collar, horse, Ballack & Weston 542,130
Collar, horse, C. Block 542,218
Combing machines, stop motion for cotton, G. Townsend 541,903
Commutator brush, H. B. Collins 541,919
Concrete on inclined surfaces, apparatus for laying, Grant & Mooney 541,848
Conveyer for tamping materials, Elliott & Carrington 542,151
Cooler. See Water cooler.
Corn breaker, and cornstalk shredder, J. Carrey 541,964
Corrugating machine tool, B. Hall 541,852
Cotton gin, saw, J. A. Maxwell 541,878
Cots, hammocks, etc., bottom for, B. F. Neely 541,872
Coupling. See Car coupling. Pipe coupling.
Crushing and grinding mill, Lightner & Newsom 542,087
Cultivator, A. Lindgren 541,975
Cultivator, disk, L. E. Waterman 541,906
Currycomb, H. T. Richmond 541,883
Curtain, berth, S. Hughes 542,056
Curtain roller bracket, E. C. Heikes 542,017
Cutter. See Band cutter. Joint cutter. Quill cutter. Tube cutter.
Cutting tool, combined, J. Carpenter 541,963
Dental bridgework, B. B. Bray 542,138
Dental chair attachment, R. M. Mayes 541,940
Dental plugger, F. J. Richards (r) 11,502
Derailing switch and safety frog, C. W. Rahbar 542,028
Desk and seat, combined, M. D. Nelon 541,982
Door and hanger therefor, sliding, W. W. Holmes 541,971
Door, automatic gravity closing watertight, G. W. Melville 542,169
Door check, G. W. Wright 542,129
Drier. See Clothes drier.
Drill. See Metal drill. Mining drill. Rock drill.
Drilling tool, M. C. Johnson 542,223
Drying frame, M. Mayer 541,869
Dye, P. Finkelstein 542,046
Dye, substantive cotton, J. J. Brack 542,073
Dyeing Lauber & Caberti 542,022
Dyeing machine, skin, R. Ergang 542,188
Ear muff, D. Basch 541,824
Eaves trough hanger, M. L. Hunker 542,222
Electric circuits, automatic safety device for, L. G. Rowand 542,030
Electric machine, dynamo, T. H. Hicks 541,854
Electric wire joint, A. Gartner 541,908
Electrical conductors, manufacture of, L. W. Downes 541,921
Electrolytic process and apparatus, L. P. Hulin 542,057
Elevator door, G. W. Morgan 542,023
Elevators, operating valve for hydraulic, J. H. Curran 541,993
Embalming instrument, O. V. Thornton 541,901
Engine. See Pumping engine.

© 1895 SCIENTIFIC AMERICAN, INC.

Envelope making and gumming machine, F. T. Nicholson 542,003
Evaporating apparatus, T. Craney 542,078
Extension table, A. Brodin 542,139
Eye shade, I. Goodman 542,015
Eyeglass nosepiece, H. Borsch ..... 541,957 to 541,961
Faucet, J. S. Lester 542,201
Feedwater heater, B. V. Nordberg 542,004
Feedwater regulator, M. Doerhoefer 542,150
Fence, wire, J. M. Denning 542,185
Fender. See Car fender. Fireplace fender.
Fifth wheel, vehicle, L. Burg 542,076
File and record cabinet, document, P. Fraizer 542,189
Filtering bed, detachable water, A. J. Harder 541,970
Fire engine heater, H. E. Penney 542,065
Fireplace fender, O. P. Mason 542,062
Fireplace water heating apparatus, open, Martin & Jones 541,867
Flanging machine, circular, W. H. Wood 542,127
Furnace. See Boiler furnace.
Furnace for metallurgical purposes, S. P. Hutchinson 541,931
Gage. See Micrometer gage.
Galvanic battery, R. W. Gordon 542,049
Game apparatus, coin-controlled, C. C. Clawson 541,991
Garment fastener, G. E. Adams 542,215
Garment, sleeping, W. Denton 541,995
Garment supporter, C. W. Stimson 542,212
Gas or other like motor, J. E. Weyman et al 542,124
Gate. See Bridge gate. Railway gate.
Gate, Wolfe & Gibson 542,180
Gearing, C. Muehleisen 542,094
Gearing, changeable, speed, C. Muehleisen 542,095
Generator. See Steam generator.
Girders, pillars, etc., means for binding together metal tubes serving for, Church & Ettenger 542,145
Glass, apparatus for shaping designs on blown, B. A. Gruhl 541,851
Governor, F. F. Fischer 542,013
Governor, gas engine, J. A. Charter 542,043
Grinding apparatus, Nichols & Bloomheart 542,099
Gunpowder, smokeless, Whistler & Aspinwall 541,910
Hair, crimper, F. E. Allen 542,216
Handle, T. W. Hickson 541,855
Harrow seeder attachment, W. A. Van Deusen 541,904
Harvester, corn, G. W. Packer 541,875
Harvester truck, Sellers & Guttery 542,067
Hat band, mourning, M. & I. Grenthal 542,158
Hat fastener, W. G. Kirchhoff 542,082
Heater. See Feedwater heater. Fire engine heater.
Heel nail feeding machine, J. B. Lesuer 541,861
Heel nailing machine attachment, Pope & Waugh 542,205
Heels, machine for moulding spring, B. E. Morrison 542,092
Hook, E. A. Schley 541,886
Hook and buckle, combined, H. T. Richmond 541,884
Hook and hammer, combined, H. A. Tilett et al 542,178
Horseshoe bar, J. Benfield 541,956
Horseshoeing machine, S. Cunningham 541,920
Hose shut-off clamp, E. M. Lundholm 541,965
Ice tongs, J. R. Finley 541,842
Indicator. See Station indicator.
Injector, gasoline, J. M. Olinger 541,874
Ink well cover, B. J. Coughlin 541,965
Iron construction, concrete, E. L. Ransome 542,206
Joint. See Electric wire joint. Railway track joint.
Joint cutter, B. J. Spilker 541,952
Kitchen cabinet table, F. B. Inger 541,858
Knitting machine, J. A. House 542,055
Knitting machine, warp, W. Roberts 542,208
Knob attachment, J. A. Giese 542,048
Knockdown rack, J. H. Bowley 541,989
Ladder, triple, G. F. Lawver 542,085
Lamp, incandescent electric, R. Greer 541,929
Lamp, miner's, W. G. Price 541,948
Lamps, safety device for handling electric arc, E. P. Snowden 542,210
Lasting machine, D. Lake 542,199
Latch, J. Henderson 542,161
Lathing, M. C. Nichols 542,098
Lavatory overflow, T. C. Beaumont 541,826
Lawn sprinkler stand, N. L. Rigby 542,029
Lock, See Rim lock. Switch lock.
Lock, J. Mlotkowski 542,001
Locomotive, electric, T. E. Adams 542,036
Locomotive turntable, C. R. Osborne 541,943
Loom Jacquard mechanism, G. Pavia 541,879
Lubricator. See Axle lubricator.
Lubricator, W. E. Sweet 542,118
Luggage carrier, J. H. Steen 541,989
Magazine camera, M. Boelte 541,832
Match safe, J. W. Hart 541,853
Matrix making and printing bar casting machine, Lee & Lebrun 542,124
Matte and slag separating well, J. D. Davies 542,148
Measuring machine, J. L. Kellum, Jr 542,195
Mechanical movement, P. Diehl 541,840
Mechanical movement, D. L. Tower 542,179
Medicinal preparation from blood, E. R. Kobert 541,933
Metal drill, W. J. McGebe 541,980
Micrometer gage, C. F. Bowman 541,916
Mill. See Crushing and grinding mill. Rolling mill. Windmill.
Mining drill, Elliott & Carrington 542,153
Moulding machine, W. L. Belknap 542,038
Mop holder and wringer, A. M. Bien 542,134
Mop wringer, A. T. Lainson 541,935
Motor. See Gas or other like motor.
Music leaf turner, Thomsen & Allerton 541,900
Music support, A. B. Buckland 541,834
Musical instrument stringing device, E. L. Gosse 542,157
Necktie fastener, G. H. Russell 542,031
Nitropentaerythrit, making, B. Thieme 541,899
Nozzle, variable exhaust, W. E. Symons 541,893
Nut lock, G. H. Beaumont 511,825
Nut sheller, J. Prade 542,104
Oar, bow facing, E. Pink 541,946
Oiling vehicle axles, device for, C. T. Moorman 542,064
Ores, dephosphorizing iron, W. B. Phillips 542,171
Organ, M. Hetherington 542,221
Organs, key holding device for pipe, H. E. Hodgson 542,054
Package, shipping, J. B. Alliger 541,820
Packing for pistons, valves, etc., W. A. Braden 542,137
Packing, metallic, E. L. Raynsford 542,106
Packing, metallic, Symons & Smith 541,894
Pad. See Check pad. Surgical pad.
Padlock, C. H. Johnson 542,194
Paint, roofing, W. T. Leathers 542,086
Paper box making machine, E. H. Taylor 541,953
Paper boxes, machine for manufacture of, E. H. Taylor 542,225
Paper tube machine, C. Howells 542,192
Pedometer, Reinisch & Kratochwil 542,107
Penholder, T. C. Campbell 542,144
Phonograph, T. A. Edison 541,923, 541,924
Phosphates soluble in dilute citric acid, making, D. T. Day 542,080
Piano, A. N. Adams 541,913
Piano action, H. Wagner 541,905
Piano muffler or damper, W. A. Bein 542,132
Picture, translucent, A. Von Cotzbausen 541,836
Pipe coupling, W. Weaver 541,908
Pipe wrench, C. L. Dunham 542,012
Pipe wrench, chain, J. C. Booth 542,136
Planter, corn, F. J. Becker 541,955
Pocket companion, J. M. Hocker, Jr 542,162
Pool counter, P. M. Cunningham 542,147
Powder. See Gunpowder. Smokeless powder.
Press. See Printing press. Seal press.
Printer's galley, Rebuschatis & Collins 541,882
Printing press, plate, J. T. Robertson 541,985
Protective apparatus, B. B. Whittemore 542,072
Pulley, expansion, J. Muir 541,870
Pulley, split, M. B. Lorah 542,166
Pulp machine for moulding hollow ware from, M. L. Deering 541,966
Pulverizer, G. P. Janes 541,972
Pump attachment, beer, J. F. Beyerlein 541,831
Pump valve, G. De Laval 542,083
Pumping engine, compensating, G. De Laval 542,084
Purifier, separator, and grader, D. J. Davidson 542,011
Quill cutter, W. R. Fox 541,996
Rack. See Knockdown rack.
Rail bond, P. Cunningham 541,838
Railway block signal, W. G. Roome 541,949
Railway brake, C. F. Grather 541,849
Railway, conduit electric, L. R. & A. H. Lavalle 542,164
Railway, conduit electric, L. C. Pressley 542,105
Railway gate, automatic, J. Weill 542,123
Railway switch, E. E. Bailey 541,822
Railway switch mechanism, U. G. Meenach 542,167
Railway switch operating mechanism, A. R. Moore 542,090
Railway tie plate, B. Reece 541,984
Railway track joint, F. W. Bond 542,135
Reamer for use in mining, Elliott & Carrington 542,152
Register. See Autographic register. Cash register.
Rim lock, H. J. Pleau 541,947
Ring, Lathrop & Walsh 541,974
Rock drill, T. W. Chapman 542,010
Rolling mill, metal, O. C. Hall 542,016
Rowing apparatus, E. Kindscher 542,197
Rowing machine, Hinton & Stansfield 541,857
Salt, apparatus for manufacturing, T. Craney 542,044
Sand papering machine, H. E. Pauk, Jr 541,878
Sash balance, R. McMillen 542,025
Sash catch, window, A. E. Graham 542,050
Sash fastener, J. M. Harper 541,930
Sash fastener, window, G. W. Goss 541,847
Saw swage, R. Morrell 541,942
Scissors, R. P. Bowdoin 542,133
Scoop, weighing, H. G. Stiebel, Jr 541,891
Scow, J. Russell 542,111
Screw threads, die for cutting, M. Rouse 542,006
Seal press, T. D. Willever 542,035
Sewing machine, J. M. Merrow 541,977
Sewing machine for barring and tacking, H. L. Kemp 542,196
Shaft for driving mechanisms, flexible, Fravega & Janet 541,997
Shank stiffener, J. M. Watson 542,070
Shank stiffener machine, N. C. Ruberg 542,032
Shears. See Sheep shears. Steam shears.
Sheep shears, L. J. Loblein 541,862
Sheet metal of stove boards, machine for clinching, W. Westlake 542,071
Sheet metal plates, apparatus for treating, J. D. Grey 542,159
Sheller. See Nut sheller.
Shelving, C. O. Shupert 542,114
Shoe, cork sole, G. H. Gifford 541,999
Shoemaking tool, E. M. Cole 541,918
Shoulder brace, F. J. Birney 542,009
Show top, H. Goldman 541,927
Shutter fastener, A. Heller 542,051
Shutter worker, T. Kochka 542,059
Shuttle, bobbin, T. Hampson 542,160
Signal. See Railway block signal.
Signal box, police patrol, E. Brombacher 542,074
Signaling, D. L. V. Browne 542,142
Slate punching and dressing machine, Bair & Thompson 541,823
Slicing and paring machine, J. Netrefa 542,097
Smokeless powder, Whistler & Aspinwall 541,909, 541,911
Snow cleaning machine, G. B. Siccardi 542,209
Snow plow for street railways, J. H. Graham 541,928
Sole leveling machine, E. E. Winkley 541,988
Sole rounding machine, G. Julian (r) 11,501
Sprinkler. See Automatic sprinkler.
Stamp, hand, J. E. Bates 542,131
Stanchion, S. S. Silvis 542,176
Starch into coherent masses, forming, A. Moffatt 541,941
Station indicator, W. J. Hull 542,193
Steam boiler, H. H. Taylor 541,896, 541,897
Steam generator, T. Craney 542,045
Steam generator, E. H. Korsmeyer 541,934
Steam generator, S. E. Light 541,938
Steam Shears, G. Guild 542,190
Steam trap, J. H. Dewhurst 542,149
Stitching machine, wire, Philpott, Jr., & Briggs 542,005
Stone blocks, machine for dressing surfaces of, Dutro & McFeely 542,186
Stone polishing machine, A. D. Moore 541,978
Stopper. See Bottle valve stopper.
Straw carrier, J. R. Ingels 541,932
Straw stacker, pneumatic, F. F. Landis 541,936
Surgeon's operating table, C. R. Lentz 542,060
Surgical pad, J. H. Morrison 542,202
Swaging machine, A. J. Langelier 542,020, 542,021
Switch. See Derailing switch. Railway switch.
Switch lock, S. E. Barlet 542,182
Switch movement, J. R. Trisler 541,954
Switch stand, U. G. Meenach 542,168
Table. See Extension table. Kitchen cabinet table. Surgeon's operating table.
Tablet machine, C. A. Tatum 541,895
Tap and bushing, J. Mohn 542,063
Tap plug and faucet, combined, A. Hallowell 542,081
Telegraphy, automatic, P. B. Delany 541,967
Telegraphy, duplex and diplex, M. M. Davis 541,994
Telephone switch boards, annunciator circuit for, C. E. Scribner 542,066
Telephone system, A. S. Hibbard 542,052
Telephony, magneto electric, E. S. Halsey 542,191
Thread or twine holder, G. H. Hedge 542,220
Tire regulator, W. A. Beebe 541,828
Toll collector and annunciator, coin operated, W. A. Rogers 542,109
Toy gun, W. R. M. Tenney 542,212
Transplanter, W. J. Doyle 541,841
Trap. See Steam trap.
Trimmer. See Wick trimmer.
Trolley restoring attachment, W. D. McDaniel 542,002
Trolley wire clip, F. W. Haeusgen 541,969
Tube cutter, J. J. K. Fitzpatrick 542,219
Tubulous boiler, Bentzen & Olsen 541,829
Type bar and making same, composite, Brott & Kay 542,140
Typewriter cleaner, W. R. Swartwout 541,892
Typewriter copy holder, E. A. Lyman 541,939
Umbrella and cane, E. C. Geneux 541,844
Umbrella holder, W. J. Slyder 541,951
Upholstery, J. A. Staples 542,115
Valve, air, Paige & Allen 541,876
Valve, gas, J. D. McIlhenny 542,024
Valve, globe, H. Burns 542,039
Valve, hot gas, J. T. Christie 541,990
Valve mechanism, F. P. High 541,856
Vehicle side spring, J. Jackson 542,019
Velocipede, baby walker, and coach combined, B. F. Shull 541,887
Vending apparatus, coin-controlled, H. Mattes 542,000
Wagon brake, W. J. Stephenson 542,116
Walls, etc., composition of matter for covering, C. B. Rockwood 542,172, 542,173
Washing machine, Wood & Dixon 542,181
Water closet bowls, ring, rod, and bar for repairing leaks in, W. H. Whitmyre 541,912
Water closet flushing tank or reservoir, H. J. Luff 542,061
Water cooler and refrigerator, combined, F. R. Beal 542,217
Weather strip for doors, H. Rudebock 542,007
Webs, apparatus for severing rolled, D. E. Titsworth 542,121
Well sinking apparatus, M. T. Chapman 541,835
Wheel. See Fifth wheel.
Wheel, J. M. Combs 542,184
Wick trimmer, lamp, J. L. Purinton 542,027
Winding machine, cloth, W. P. Simpson 542,034
Windmill, E. S. Crawford 542,146
Window fastener, W. Hickey 542,053
Wiper, rotary, Cloud & Lappin 541,992
Wire, apparatus for manufacture of, R. D. Sanders 541,986
Wire stretcher, M. Gross 541,850
Wire swaging machine, E. W. Vaughan 542,213
Wood bending machine, G. Stickley 541,890
Wood hog, E. W. Brown 542,075
Wrench. See Pipe wrench.
Wrench, C. Becher 541,827
Wringer. See Mop wringer.
Yarn drying apparatus, O. Duckworth 541,922
Yoke attachment, neck, B. J. Sykes 542,119
Yoke, neck, C. H. Lambert 542,200

TRADE MARKS.

Apparel, certain named wearing, Union Special Sewing Machine Company ..... 26,742 to 26,744
Baking powder, J. D. Gregory 25,756
Beer, bottled lager, Valentin Blatz Brewing Company 26,749
Beer, lager, United States Brewing Company of Chicago 26,750
Belting, leather, C. A. Schieren & Co 26,748
Blood purifier, L. A. Krehbiel 26,760
Bug and roach exterminator, water, J. S. Juno 26,767
Cakes and crackers, D. Stewart 26,755
Candy, J. A. McClurg 26,754
Chimneys, lantern globes, and reflectors, Gill Brothers & Co ..... 26,770 to 26,773
Cleaning and disinfecting preparation for materials and fabrics, Lariat Manufacturing Company 26,766
Clothes wringers, American Wringer Company 26,778
Cotton piece goods, King Philip Mills 26,746
Cough balsam, Van Vleet-Mansfield Drug Company 26,761
Dental instruments, R. B. Donaldson 26,779
Gin, National Distilling Company 26,752
Gum, chewing, Kola Chemical Company 26,753
Headache, powdered substance for relief of, E. A. Graves 26,763
Hose supporters, button, George Frost Company 26,745
Lacing hooks, eyelets, and rivets, E. Kempshall 26,768
Medical plasters, Dr. D. P. Ordway Plaster Company 26,758
Medicinal remedies, certain named, Zem Zem Medicine Company 26,762
Medicinal remedy for dyspepsia, C. E. Lavery 26,759
Metal and wire goods, chains, cables, conductors, hard spelter, and certain rubber goods, Felton & Guilleaume 26,769
Paper bags, Union Bag and Paper Company 26,747
Sausage meat, North Packing and Provision Company 26,757
Sewing machines and parts thereof, Union Special Sewing Machine Company 26,774, 26,775
Telephones and telephonic instruments, Phoenix Telephone Company 26,780
Toilet preparations and medicinal remedies, soap, bluing, and mucilage, certain named, Red Seal Remedy Company 26,765
Tooth powder and receptacles for same, J. S. & R. M. Sanger 26,764
Whisky, A. McNab & Co 26,751
Wringers and parts thereof, American Wringer Company 26,776, 26,777

DESIGNS.

Badge, M. J. Sullivan 24,443
Bottle stopper, glass, W. W. Lowrey 24,447
Box, E. Saalbach 24,452
Buckle, D. Stone 24,444
Button, E. R. Hughes 24,445
Cake or cracker, D. Stewart 24,441
Carpet body, A. M. Rose 24,462
Carpet border, A. M. Rose 24,463
Ceiling plate, E. A. Langenbach 24,456
Cigar holder, J. M. Merritt 24,449
Furnace grate, W. S. Stevenson 24,458
Game board, W. A. Smethurst 24,454
Heater case, electric, J. F. McElroy 24,459
Knife handle, Greenleaf & Crosby 24,450
Lamp fount holder, J. E. Bobner 24,451
Monument, W. H. Perry 24,461
Picture frame, T. N. Kent 24,453
Pistol frame, W. F. Markham 24,448
Spoon or fork, G. C. Lunt 24,442
Stove, E. A. Blakslee 24,460
Strainer, sink, E. B. Vrooman 24,457
Timepiece hand, W. C. Ball 24,446
Tire cover for bicycles, H. Heaton, Jr 24,455

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

WOOD or METAL WORKERS without steam power can save *time* and *money* by using our **Foot and Hand Power Machinery**
SEND FOR CATALOGUES—
A—Wood-working Machinery.
B—Lathes, etc.
SENECA FALLS MFG. COMPANY,
695 Water St., Seneca Falls, N. Y.

LATHES, Shapers, Planers, Drills, Machine Shop Outfits, Foot Lathes, Tools and Supplies. Catalogue Free. SEBASTIAN LATHE CO., 120 CULVERT ST., CINCINNATI, O.

MANUFACTURE TO ORDER SPECIALTIES & NOVELTIES-PATENTED ARTICLES-SMALL OR FINE MACHINERY. SEND FOR CATALOGUE OTTO KONIGSLOW 49 MICHIGAN ST. CLEVELAND, O.

AMERICAN PATENTS.—AN INTEResting and valuable table showing the number of patents granted for the various subjects upon which petitions have been filed from the beginning down to December 31, 1894. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1002.** Price 10 cents. To be had at this office and from all newsdealers.

HAVE YOU SEEN The New Green River Al Drilling Machine?
Everything done—drilling and reversing—with one hand without taking it from crank. Price - - **$15.00**
☞ *Send for Catalogue.*
WILEY & RUSSELL MFG. CO.
Greenfield, Mass., U. S. A.

BUY TELEPHONES
That are good—not "cheap things." The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are **BOTH GOOD.**
WESTERN TELEPHONE CONSTRUCTION CO.,
440 Monadnock Block, CHICAGO.
Largest Manufacturers of Telephones in the United States

BARNES Foot-Power MACHINERY. CATALOGUE FREE.
Machines for Carpenters, Cabinet Makers, Machinists, Electricians, Blacksmiths, Inventors, Manual Training Schools, Model Makers, Bicycle Repairers, Amateur Mechanics.
FOR WOOD AND METAL WORK.
THE BEST FOOT POWER MACHINES IN THE WORLD.
W. F. & JOHN BARNES CO., 1999 RUBY ST., ROCKFORD, ILL.

BALL BEARING AXLES AND RUBber Tires.—A paper read before the Carriage Builders' National Convention, Philadelphia, October, 1894, showing the advantage to be derived from the use of ball bearings and pneumatic tires in road vehicles. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **992.** Price 10 cents. To be had at this office and from all newsdealers.

VANDUZEN STEAM JET PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor freezes. Every Pump Guaranteed.
—10 SIZES.—
200 to 12000 Gallons per Hour.
Cost $7 to $75 each. Address
THE E. W. VANDUZEN CO.,
102 to 108 E. Second St., Cincinnati, O.

EDGE TOOLS
are often nearly ruined by using a grindstone not adapted to the work. Our quarries produce a large variety of grits suitable for grinding any tool.
☞ *May we send you our Catalogue, which will give you some information?*
GRAFTON STONE COMPANY,
No. 80 River Street, GRAFTON, OHIO.

GATES ROCK AND ORE BREAKERS
OVER 3000 IN USE THROUGHOUT THE WORLD
GREATER CAPACITY USING LESS POWER THAN ANY OTHER ON EARTH
MODERN MINING MACHINERY OF EVERY DESCRIPTION
GATES IRON WORKS DEPT T 650 ELSTON AVE CHICAGO.

HYPNOTISM My original method $2. 100 pp. pamphlet 10c. One on Personal Magnetism 10c. Dr. Anderson, S A 7, Masonic Temple, Chicago.

MECHANICAL DRAWING TAUGHT BY MAIL
Mechanics, Steam Engineering, Electricity, Architecture, R. R. and Bridge Engineering, Plumbing, Heating, Mining, English Branches. Send for free circular, stating subject wish to study or your trade.
Correspondence School of Industrial Sciences, SCRANTON, PA.

Study Electricity at Home
by our correspondence method, with FREE APPARATUS. Terms low. Cat. free. Scientific Machinist, Clevel'd, O.

ELECTRICAL PHENOMENA ILLUStrated by Applied Hydraulics.—Mr. G. Claude's method of applying the movements of water to illustrate a few of the first principles of electrical phenomena in such a way as to enable the student to better understand and the tutor to explain them. With 14 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **979.** Price 10 cents. To be had at this office and from all newsdealers.

They All Like It. The Ladies Like It. So Do The Men. Children Enjoy It.
Layman Pneumatic Boats.
☞ See SCI. AM., May 18, 1895.
Send 4c. in stamps for our handsomely illustrated catalogue.
Address H. D. LAYMAN,
851 Broadway, New York.

ARTESIAN WELLS—BY PROF. E. G. Smith. A paper on artesian wells as a source of water supply. Essential geological conditions of artesian wells. Some chemical features of artesian well supply. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **943.** Price 10 cents. To be had at this office and from all newsdealers.

OUR WELL DRILLS
awarded Highest Medal at the World's Fair.
All latest improvements. Catalogue free.
F. C. AUSTIN MFG. CO., CHICAGO, ILL.

CONTRACTS SEND IN YOUR ORDERS WANTED FOR LIGHT METAL WORK WILL BE GLAD TO MAKE PRICES LOW SPECIAL FACILITIES FOR MAKING MODELS
C. F. WELCH MFG. CO. 6 DUBOIS ST. BOSTON

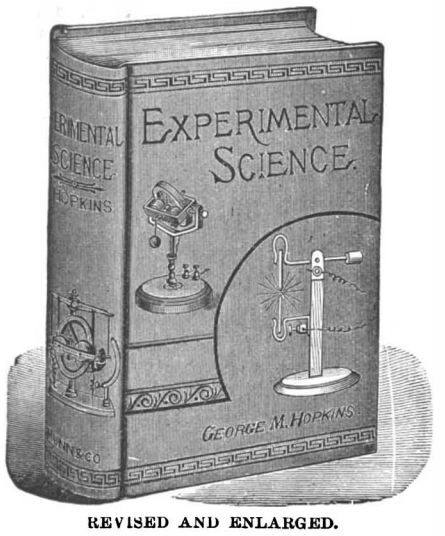
ELECTRICITY AND PLANT GROWing.—A paper by Prof. L. H. Bailey, of Cornell University, describing and giving the results of a series of experiments upon the effect of electrical illumination upon the growth of plants. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **990** and **991.** Price 10 cents each. To be had at this office and from all newsdealers.

WE DON'T
want to "Bore" you but would like to "Drill" the fact into you that we can quote you some interesting prices on Blacksmith Drills, "You will never buy cheap unless you ask the price."
Address:
Shipman Eng. Mfg. Co.
ROCHESTER, N. Y.

BI-SULPHIDE OF CARBON for use in the arts, Killing Insects in Grain, Killing Burrowing Animals, etc. Manufactured by E. R. TAYLOR, Cleveland, Ohio

STARRETT'S Adjustable Jaw Cut-Nipper.
Jaws are detachable, so they can be removed, ground, and adjusted when worn. All parts case-hardened except jaws. Flat spring below cutting edges obviates danger of breaking jaws.
Price, 6 inch M (for music wire) $2.00
" 6 inch C (for common wire) 2.00
☞ *Illustrated Catalogue Free.*
The L. S. Starrett Co. Manufac'r of Fine Tools, P. O. Box 13, Athol, Mass.

NOW READY!
Seventeenth Edition of
Experimental Science



REVISED AND ENLARGED.
120 Pages and 110 Superb Cuts added.

Just the thing for a holiday present for any man, woman, student, teacher, or anyone interested in science.
In the new matter contained in the last edition will be found the Scientific Use of the Phonograph, the curious optical illusion known as the Anorthoscope, together with other new and interesting Optical Illusions, the Optical Projection of Opaque Objects, new experiments in Projection, Iridescent Glass, some points in Photography, including Hand Cameras, Cane Cameras, etc.; Systems of Electrical Distribution, Electrical Ore Finder, Electrical Rocker, Electric Chimes, How to Color Lantern Slides, Study of the Stars, and a great deal of other new matter which will prove of interest to scientific readers.
840 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, by mail, $4. Half morocco, $5.
☞ *Send for illustrated circular.*
MUNN & CO., Publishers,
Office of the SCIENTIFIC AMERICAN,
361 BROADWAY, NEW YORK.

© 1895 SCIENTIFIC AMERICAN, INC.

Founded by Mathew Carey, 1785.

HENRY CAREY BAIRD & CO.
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS
810 Walnut St., Philadelphia, Pa., U. S. A.

☞ Our New and Revised Catalogue of Practical and Scientific Books, 90 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

The Scientific American Reference Book.

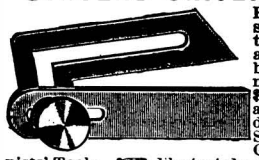
A most useful little bound book of 150 pages, comprising, probably, the most extensive variety of standard, practical, condensed information ever furnished to the public for so small a price, only 25 cents.

Among its contents are: The Last Census of the United States (1890), by States, Territories, and Counties; Table of Cities having over 8,000 inhabitants; Map of the United States—miniature outline; The Patent Laws (full text): The Trade Mark Law (full text); The Copyright Law (full text); The Principal Mechanical Movements—illustrated by 150 small diagrams—of value to inventors and designers of mechanism; Medallion Portraits of Distinguished American Inventors; Valuable Tables relating to Steam, Electricity, Heat, Metals, Weights, and Measures.

☞ *Sent by mail to any address on receipt of price,* **25 cents.**

MUNN & CO., Publishers,
361 Broadway, New York.

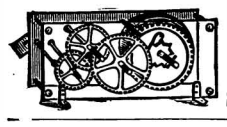
STEVENS UNIVERSAL BEVEL.



Far superior to the old style gauge. Blade offset to allow it to stand parallel at any angle with body of tool. Price by mail, postpaid: 1¼ inch, $1.25; 3 inch, $1.50. Ideal and Leader Spring Dividers and Calipers, Ideal Surface Gauges, Depth Gauges, and Fine Machinists' Tools. ☞ *Illustrated catalogue free to all.*
J. STEVENS ARMS AND TOOL CO.,
P. O. Box 280, Chicopee Falls, Mass.

ICE MACHINES, Corliss Engines, Brewers' and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton Street, Milwaukee, Wis.

COMPLETE SMALL SIZE NEW MILLING MACHINE.
Full Capacity of Larger Machines
Indispensable for students, inventors, model makers, etc. For cutting gears, pinions, fluting taps and reamers and all intricate milling.
Made specially for small work. With or without tight and loose pulley countershaft. Price within the reach of all.
☞ Write for full particulars.
Little Giant Bench Miller **RICHARDS MFG. CO 218 Fulton St., Brooklyn, N. Y.**



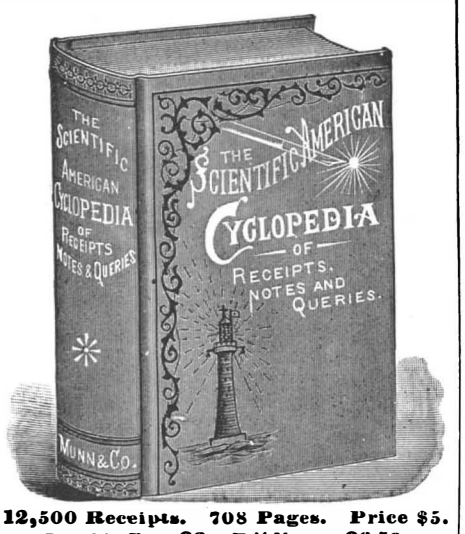
BOSTON GEAR WORKS,
Boston, Mass.
☞ *Send for Catalog G.*
Gears every style.
Spring Motors for Turn Tables, etc.

MEASUREMENT OF POWER.—BY G. D. Hiscox, M.E. A description of several improved forms of absorption and transmitting dynamometers for the measurement of the useful work of prime movers in mills and factories. With 17 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **992.** Price 10 cents. To be had at this office and from all newsdealers.

HELLO, CENTRAL!

Do you use telephones? If so, we can give you just what you want. Our specialty is Blake Transmitters. There is a "best" in everything, and ours are the best. We supply complete telephones or all or any of the parts to construct a telephone. Write for illustrated catalogue.
PHŒNIX INTERIOR TELEPHONE CO.,
131 Liberty St., New York.

A Valuable Book



12,500 Receipts. 708 Pages. Price $5.
Bound in Sheep, **$6.** *Half-Morocco,* **$6.50.**

This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the Scientific American during the past fifty years; together with many valuable and important additions.

Over Twelve Thousand selected Receipts are here collected; nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form convenient for ready use.

Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.

Instructions for working many different processes in the arts are given.

Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings.

Those who are in search of independent business or employment, relating to the home manufacture of salable articles, will find in it hundreds of most excellent suggestions.

☞ *Send for Descriptive Circular.*

MUNN & CO., Publishers,
SCIENTIFIC AMERICAN OFFICE,
361 Broadway, New York.

THIS IS RAZOR STEEL.

Note that fact, for you have tried common "steel" blades till you are tired. These blades are hand forged; note that. Most blades are made by the drop of a die. This knife will take an edge and keep it. It is strong, yet compact and neat. Price, postpaid, with 2 blades: ebony handle, 35c.; ivory, 75c.; pearl, $1. With 3 blades: ebony, 90c.; ivory, $1.; pearl, $1.25. Our strong 2 blade jack knife is 50c.

Order direct of us; we do not "*drum*" dealers. ☞ Send for illus. 80 page free list and "How to Use a Razor."
MAHER & GROSH, 40 A St., Toledo, Ohio.

WANTED—A competent Manager for Boiler Works and Machine Shop. Must be experienced and able to give estimates if required. Address F. C., 59 Liberty Street, Room 16, New York City.

Durable—Easily Applied.
This roofing is manufactured from natural Trinidad asphalt materials, and will not dry up and become brittle under exposure to the weather as coal-tar roofings do. ☞ *Send for free sample of roof 12 years old, with circular and price list to*
WARREN CHEMICAL & MFG. CO.,
85 Fulton Street, New York, U. S. A.

ELECTRO MOTOR. SIMPLE. HOW TO make. By G. M. Hopkins.—Description of a small electro motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **641.** Price 10 cents. To be had at this office and from all newsdealers.

Send your business card for 150 p. 1895 catalogue.

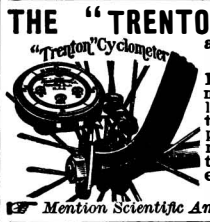
NICKEL AND ELECTRO-PLATING
Apparatus and Material.
THE Hanson & VanWinkle Co.
Newark, N. J.
81 LIBERTY ST., N. Y.
35 & 37 S. CANAL ST., CHICAGO.

VOLNEY W. MASON & CO.
FRICTION PULLEYS, CLUTCHES, and ELEVATORS
PROVIDENCE, R. I.

NAFEW-LOVELL CHECK PROTECTOR

Perfect in construction. Modern. Highly Finished and Cheapest. Simple in Operation. Compact. No parts to wear out. Unlimited Guarantee. A Certain Protector. Sent on approval, to any responsible firm. Price, $8.50. Agents wanted. Catalogue sent Free.
SAMUEL NAFEW COMPANY,
26 Cortlandt St., New York, U. S. A., Manufacturers.

THE "TRENTON" CYCLOMETERS



are unequaled at any price.
MADE OF ALUMINUM.
Handsomest and lightest on the market. Weight 2¼ oz. Absolutely accurate. Fully guaranteed. Dustproof and waterproof. Registers 1,000 miles and repeats. Ask your dealer for them and you will want no other. Price, **$2.00.**
TRENTON WATCH CO.,
☞ *Mention Scientific American.* Trenton, N. J., U. S. A.

MESSRS. MUNN & CO., Solicitors of Patents, have had nearly fifty years' continuous experience. Any one may quickly ascertain, free, whether an invention probably is patentable by writing to Munn & Co. Communications strictly confidential. A handbook of patents and how to obtain them sent free.

PATENTS

taken through Munn & Co. receive special notice in the *Scientific American.* This splendid weekly paper, elegantly illustrated, has the largest circulation of any scientific work. $3 a year. Specimen copies free.
Address MUNN & CO.,
New York, 361 Broadway.

WANTED—A CENTRIFUGE—Secondhand. Address A. M. C., 13 Gold St., N. Y.

STEEL TYPEWRITER TYPE
TYPE WHEELS, MODELS & EXPERIMENTAL WORK. SMALL MACHINERY NOVELTIES & ETC. NEW YORK STENCIL WORKS 100 NASSAU ST. N.Y.

GAS ENGINE CASTINGS
also for Water Motor, Dynamo, Boiler, Engine, etc.
A. F. WEED & CO., 106 Liberty St., N. Y.

AGENTS WANTED
to sell the **Best Cooking Kettle in the World.** No more scalded or burned hands. They are made of **Steel** and Granite lined, and adapted for general use. Covers and Steamers and fire-proof Stove Mats included. Every piece warranted. ☞ *Sample free and territory secured.* Address
A. W. OBERMANN,
55 S. 5th Avenue, N. Y. CITY.

THE FISHER Patent Steam Pump Governors
For Steam Pumps Working under Pressure and the
FISHER PATENT GRAVITY GOVERNORS
For Steam Pumps filling elevated open tanks, are the most positive and durable devices made for the purpose.
REDUCING VALVES.
☞ Send for circulars and testimonials.
FISHER GOVERNOR CO.,
201 S. 1st Avenue. - - Marshalltown, Iowa.

IDEAS DEVELOPED. Absolute secrecy. Send for particulars. Advice and suggestions free. Correspondence and sample orders solicited. 25 years in business. **Gardam & Son,** 98 John St., New York.

THE NEWSPAPER AND THE ART of Making It.—An address delivered at Cornell University, by Charles A. Dana, editor of the New York Sun. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **995.** Price 10 cents. To be had at this office and from all newsdealers.

TELEPHONES

Transmitters, Receivers, Magneto Bells, Cords and Parts of Telephones.
☞ *Send Stamp for Catalogue.*
MIANUS ELECTRIC CO.,
MIANUS, CONN.

Parson's Horological Institute.
School for Watchmakers
ENGRAVERS AND JEWELERS.
☞ *Send for Catalogue and References.*
PARSON'S HOROLOGICAL INSTITUTE,
302 Bradley Avenue, PEORIA, ILL.

PUMPS FOR COMPRESSING OXYGEN & HYDROGEN GASES INTO CYLINDERS BY HAND POWER. PRICE $15.00 SEND FOR CATALOGUE No 2 TO CHAS. BESELER, 218 CENTRE ST. NEW YORK.

DRY BATTERIES.—A PAPER BY L. K. Bohm, treating of open circuit batteries, historical dry batteries, modern dry batteries, Hellesen's battery, Bryan's battery, Koller's battery, and the efficiency of dry cells. With 3 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1001.** Price 10 cents. To be had at this office and from all newsdealers.

GASOLINE ENGINES.

1½ to 75 horse power. For Propelling Boats of all kinds. Cheapest Fuel, Absolute Safety, No Licensed Engineer, Simple Construction, Hundreds in Successful Use.
☞ *Write for illustrated catalogue.*
GLOBE GAS ENGINE CO.,
Merion Avenue & 49th Street, PHILADELPHIA, PA.

ALCO VAPOR LAUNCH.

Engine and helm controlled from bow. Latest improved and only 12 to 1 motor now ready for the market. 18 to 40 ft. launches 2, 3, 5 and 7 h. p. No licensed engineer or pilot required. *Speed and safety guaranteed. No dangerous naphtha or gasoline used.*

Marine Vapor Engine Co., Jersey City, N. J.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **59.** Price 10 cents. To be had at this office and from all newsdealers

Drum in position.

DEAFNESS
and HEAD NOISES relieved by using
Wilson's Common Sense Ear Drums.
New scientific invention, entirely different in construction from all other devices. Assist the deaf when all other devices fail, and where medical skill has given no relief. Safe, comfortable, and invisible; no wire or string attachment. Write for pamphlet.
WILSON EAR DRUM MANUFG. CO.,
Louisville Trust Co. Building, Louisville, Ky.,
☞ *Mention this paper.* and 1122 Broadway, New York

THE OBER LATHES

For Turning Axe, Adze, Pick, Sledge, Hatchet, Hammer, Auger, File, Knife and Chisel Handles, Whiffletrees, Yokes, Spokes, Porch Spindles, Stair Balusters, Table and Chair Legs and other irregular work.
☞ *Send for Circular A.*
The Ober Lathe Co., Chagrin Falls, O., U.S.A.

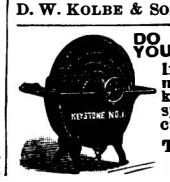
DEAFNESS & HEAD NOISES CURED by my Invisible Tubular Ear Cushions. Whispers heard. Warranted to help more cases than all similar devices combined. Help ears as glasses do eyes. Sold by F. HISCOX only, 853 Br'dway, N. Y. Send for book of proofs **FREE**

BUSHNELL'S PERFECT LETTER COPYING BOOKS

Make perfect copies of letters with ordinary office ink. No press required. Books roll up to make the copy. Indispensable to the traveler and for private use. Sent by mail, postpaid, on receipt of price.
Note size, 6x10 inches....$1.00
Letter size, 10x12 inches, $1.30
Send for circular and agents terms. Alvah Bushnell,
403 Chestnut St., Philadelphia, Pa.

PATENT STEEL
SKELETON LEGS
ARE THE BEST.
Established 1849.

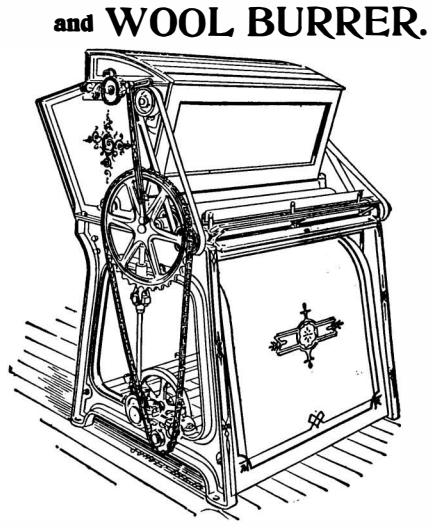
D. W. KOLBE & SON, 1339 Arch St., Philadelphia.



DO YOU USE GRINDSTONES?
If so, we can supply you. All sizes mounted and unmounted, always kept in stock. Remember, we make a specialty of selecting stones for all special purposes. ☞ *Ask for catalogue.*
The CLEVELAND STONE CO.
2d Floor, Wilshire, Cleveland, O.

Family Ice Machine Ice, etc., in a few minutes, $10 and up. Filters, $1.25 and up. Cookers, $1. Seltzateurs to prepare one's self soda water, $4.50 and up. L. DERMIGNY, 126 W. 25th St., N. Y.

A REVOLUTION!!!
A New COTTON GIN and WOOL BURRER.



Inventive genius has at last produced a machine that will send into retirement the old Saw Gin so long tolerated, owing to enormous development in the cotton industry. The Universal Cotton Gin and Wool Burrer Company are taking out patents in the principal countries, and make claim to superiority over the system now in use on the following among other points: The new Roller Gin will preserve the fibre intact; clean the seed more thoroughly, and thus save a large amount of cotton; prevent the possibility of fire; perform the work with a minimum of power; require comparatively no repairs; require but little if any cleaning, and have no saws to sharpen. They are the acme of simplicity in construction and effectiveness in economical working. The staple delivered in the most improved condition, with the least damage to fibre ever heretofore effected. Alfred B. Shepperson, of the Cotton Exchange, New York, recognized as foremost expert and authority in the cotton world, as attested by his services to the National Department of Agriculture, and the favorable reception accorded to his opinions and publications, is President of this Company; T. H. Pearse, Secretary; E. A. Kingman, Treasurer; and S. L. Johnston, Superintendent and Engineer. A hand machine and also full size power gins may be seen in operation. A limited amount of treasury stock is for sale. For full particulars address

UNIVERSAL COTTON GIN & WOOL BURRER CO.,
Room 60
FISKE BUILDING 89 STATE ST., BOSTON.

CARBORUNDUM HARDEST ABRASIVE KNOWN. EMERY AND DIAMOND POWDER SUBSTITUTE. IN FLOUR, POWDER, CRYSTAL, WHEEL, SLAB & HONE FORM. CARBORUNDUM CO. MONONGAHELA CITY, PA. U.S.A.

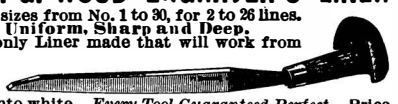
Telephones

Sold outright. Cannot get out of order. *Guaranteed free from infringement.* Suitable for exchanges or private plants. ☞ *Send for Testimonials and Prices.* Some good territory left for reliable agents.
MASON TELEPHONE CO., RICHMOND, VA.

If you have a - - - - - - - -
QUEER
piece, send it on. **Light and Medium Press Work** in blanking and forming. Wire bending and swaging.
L. R. HITCHCOCK, WATERTOWN, Conn.

THE "ROUND BOX" TYPEWRITER RIBBONS
M. & M. CARBON PAPERS.
Give perfect satisfaction when others fail. Used by nearly all United States Government Departments.
Samples Free upon application.
MITTAG & VOLGER,
Manufacturers for the Trade,
Cor. Park & B.B. Aves., Park Ridge, N. J.

F. W. G. WOOD ENGRAVER'S LINER
All sizes from No. 1 to 30, for 2 to 26 lines.
Lines Uniform, Sharp and Deep.
The only Liner made that will work from



black into white. *Every Tool Guaranteed Perfect.* Price **$1.00** each, or **$10.00** a dozen. Angle, Tint, and Lozenge tools, 75c. each. Illustrated circulars free.
F. W. GESSWEIN, 41 John St., New York.
Headquarters for Jewelers' Tools and Supplies.

ARMSTRONG'S PIPE THREADING —AND— CUTTING-OFF MACHINES
Both Hand and Power.
Sizes 1 to 6 inches.
Water, Gas, and Steam Fitters' Tools. Hinged Pipe Vises, Pipe Cutters. *Stocks and Dies universally acknowledged to be* THE BEST. ☞ *Send for catalog.*
Armstrong Mfg. Co.,
Bridgeport, Conn.

Architectural Books

Useful, Beautiful and Cheap.

Any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder, and persons about to build for themselves will find the work suggestive and most useful. They contain drawings in perspective and in color, together with floor plans, costs, location of residence, etc.

Two volumes are published annually. Volumes 1 to 18, which include all the numbers of this work from commencement to December, 1894, may now be obtained at this office or from Booksellers and Newsdealers. Price, stitched in paper, $2.00 per volume. These volumes contain all the plates, and all the other interesting matter pertaining to the work. They are of great permanent value. Forwarded to any address.

MUNN & CO., Publishers,
361 Broadway, New York.

© 1895 SCIENTIFIC AMERICAN, INC.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

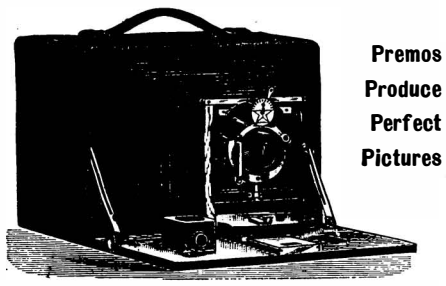
The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

EMPIRE
• BOILER CLEANER •
COMPOUND

We Don't Offer Gratuities, but our Circular will give you the information that will enable you to Save Time, Trouble and Money. *Tried, approved, and being used by the Largest Railways and Factories in the East.*
OFFICE:
Kemble Bldg., 19 Whitehall St., N.Y.

. . . WE ARE BUILDING . . .
The Celebrated
"HORNSBY-AKROYD"
OIL ENGINE
The De La Vergne Refrigerating Machine Co.
FOOT E. 138TH STREET, NEW YORK.

Premo Cameras



Premos Produce Perfect Pictures

Are perfect in construction, workmanship and finish, and contain more modern improvements than any other Camera. We make several styles and guarantee them all
ROCHESTER OPTICAL CO.
22 SOUTH STREET, ROCHESTER, N. Y.

AGENTS WANTED WRITE FOR CATALOGUE AND AGENCY. FOR FINE TOOLS IN EVERY SHOP. C. H. BESLY & CO. CHICAGO, ILL. U.S.A.

TO BUSINESS MEN

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN when selecting a list of publications in which you decide it is for your interest to advertise. This is frequently done for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.

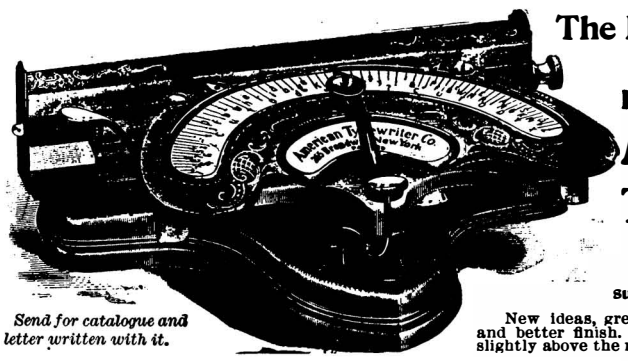
For rates see top of first column of this page or address MUNN & CO., Publishers,
361 Broadway, New York.

JESSOP'S STEEL THE VERY BEST FOR TOOLS, SAWS ETC. WM JESSOP & SONS LTD 91 JOHN ST. NEW YORK

The American Bell Telephone Company,

125 Milk Street,
Boston, Mass.

This Company owns Letters-Patent No. 463,569, granted to Emile Berliner November 17, 1891, for a combined Telegraph and Telephone, covering all forms of Microphone Transmitters or contact Telephones.



Send for catalogue and letter written with it.

The New Model No. 2
IMPROVED
American Typewriter $8
IS NOW READY.

The latest model of the first successful low-priced typewriter.

New ideas, greater speed, improved construction and better finish. Sold by the makers direct at price slightly above the manufacturing cost.

AMERICAN TYPEWRITER CO., 267 BROADWAY, N.Y.

THE BICYCLE: ITS INFLUENCE IN Health and Disease.—By G. M. Hammond, M.D. A valuable and interesting paper in which the subject is exhaustively treated from the following standpoints: 1. The use of the cycle by persons in health. 2. The use of the cycle by persons diseased. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1002. Price 10 cents. To be had at this office and from all newsdealers.

PERFORATED METAL OF EVERY DESCRIPTION FOR ALL USES
THE HARRINGTON & KING PERFORATING CO.
CHICAGO, ILL. U.S.A. AND 284 PEARL ST. NEW YORK

The KOMBI CAMERA - $3.50

Carry in pocket. Takes 25 perfect pictures in one loading—re-loading costs 20c. Ask your dealer for it, or send for free booklet "All About the Kombi."
ALFRED C. KEMPER,
Branches: London, Berlin. 132-134 Lake Street, Chicago

"H. B." CUTTING-OFF TOOL

We have recently purchased the patents and a stock of this cutting-off tool. The improvement over former tools is in the addition of steadying device; otherwise it will take regular blades used in Slate No. 2 Holder.
☞ SPECIAL OFFER. To reduce stock purchased and introduce the tool, we will for the present supply one of these holders complete with one ⅛ blade for $1.50 by express or $1.80 by mail prepaid. ☞ *Send for Catalogue.*
DWIGHT SLATE MACHINE CO., HARTFORD, CONN.

1¼ to 50 H. P.

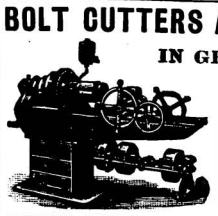
ECONOMY, RELIABILITY, SIMPLICITY, SAFETY.

INSURANCE POLICY
Motor of 19th Century

How do these look together?

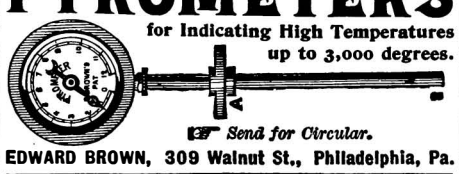
There is no disagreement, for Hundreds of our Engines have been in use 10 years or less, and Never an Instance of Fire or Explosion.
CHARTER GAS ENGINE CO.
P. O. Box 148, Sterling, Ill.

BOLT CUTTERS AND NUT TAPPERS
IN GREAT VARIETY.



Cutting all sizes up to two inches.
WELLS BROS & CO.,
Greenfield, Mass.
P. O. Box B.

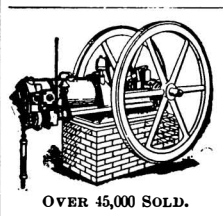
PYROMETERS
for Indicating High Temperatures up to 3,000 degrees.



☞ *Send for Circular.*
EDWARD BROWN, 309 Walnut St., Philadelphia, Pa.

HOLLY STEAM ENGINEERING CO.
343-344 Butler Exchange, Providence, R. I.
SPECIALTIES: Holly Gravity Return System; saves One-Fifth of the Fuel. Holly Pressure-Reducing Valve; no spring, lever or diaphragm. Send for circular.

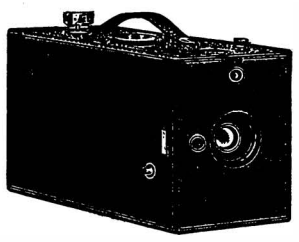
Celerite New Photographic Paper
No Collodion, no Gelatine, no Gold, no Hypo, matt surface, simple, rapid, permanent. Send for circulars and print to Jas. H. Smith & Co., 261 Wabash Ave., Chicago.



OVER 45,000 SOLD.

"OTTO"
GAS AND GASOLINE ENGINES.
½ to 100 h.p. Can be used in cities or in country independent of gas works or gas machines.
No Boiler, No Danger, No Engineer.
The Otto Gas Engine Wks., Incorp'd, Philadelphia

At ¼ Price Bicycles, Watches, Guns, Buggies, Harness, Sewing Machines, Organs, Pianos, Safes, Tools, Scales of all varieties and 1000 other articles. Lists free. CHICAGO SCALE CO., Chicago, Ill.



Kodak Quality

Some Watches sell for $2.50. But the purchaser of a $50.00 time-piece gets more for his money than the man with the cheap watch.

It's the Same With Cameras.

The Kodak lenses are alone worth more than some cameras which the manufacturers claim to be "as good as a Kodak." Kodaks are standard in hand camera values—because they make good pictures—because they are durable, reliable.

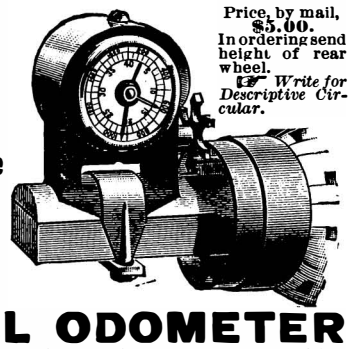
Handsomely Illustrated Kodak-alogue Free.

KODAKS, KODETS, BULLETS, $6.00 TO $100.00
EASTMAN KODAK COMPANY, ROCHESTER, N. Y.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

COMPOSITION AND CONSTITUTION of Certain Alloys.—A paper by Dr. C. R. Alder Wright, F.R.S., epitomizing the author's experimental inquiries into the subject of the relations of metals to one another as regards their mutual miscibility or solubility when rendered fluid by heat. With one illustration. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 999 and 1000. Price 10 cents each. To be had at this office and from all newsdealers.

If you own a good Horse and Carriage you will be interested in our



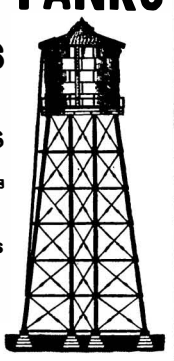
Price, by mail, $5.00.
In ordering send height of rear wheel.
☞ *Write for Descriptive Circular.*

BELL ODOMETER

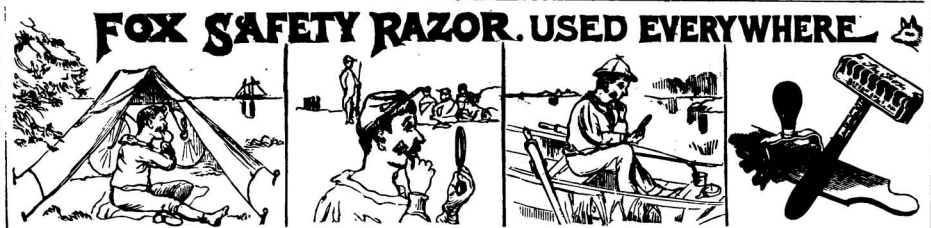
It will tell you honestly how many miles you drive, and announce each mile by stroke of a bell. Keeps a record for 1600 miles and then repeats. Speed horses may be timed very accurately. Fully warranted.
Davis, Stebbins & Co., 33 Sudbury St., Boston, Mass.

TOWERS AND TANKS

PATENT SECTIONAL
ALL IRON TOWERS
of 4 and 12 Columns,
for Water Works, Cities, Towns, and Manufactories.
PLAIN, ALL WOOD TOWERS
ELEVATED TANKS
for Automatic Fire Sprinkler Plants
MANUFACTURERS OF
IRON and STEEL TANKS.
Louisiana Red Cypress Wood Tanks a Specialty.
W. E. CALDWELL CO.,
219 E. Main Street,
LOUISVILLE, KY., U. S. A.



FOX SAFETY RAZOR. USED EVERYWHERE.



A Delicious Shave. A Continual Economy. Absolutely Guaranteed.
Razor complete, $2.00. Stropper and Strop, $1.75. Both in One Case, $3.75.
E. LOTHAR SCHMITZ, Manufacturer, 92 Reade Street, NEW YORK, N.Y.

ENGINES, Boilers and Machine Tools. New and Second-hand. *Send stamp for paper "Machinery & Supplies."* W. P. Davis, Rochester, N. Y.

EMERY. Emery Wheels, Grinding Machines and Grinders' Supplies. Quick process and large stock. When in a hurry, buy of THE TANITE CO., NEW YORK CITY, CINCINNATI, and STROUDSBURG, PA.

Patented Novelties Manufactured.
S. P. DENISON, 143 Center St., New York.

PRIESTMAN SAFETY OIL ENGINE
"Phenomenally low in cost of operation."—Franklin Inst.
NEITHER STEAM NOR ENGINEER
Kerosene, NOT Gasoline

Economical, Simple, Safe, Automatic. For Electric Lighting, Pumping, Milling, etc.
PRIESTMAN & COMPANY, Inc.
Front and Tasker Streets, - - Philadelphia

$18 buys a beautiful little Canoe; or a Magnificent Pleasure Boat for $125
☞ *Send for 60-page illus. catalog.*
J. H. RUSHTON, CANTON, N. Y.

-- THE --
SCIENTIFIC AMERICAN

☞ ESTABLISHED 1845.

The Most Popular Scientific Paper in the World

Only $3.00 a Year, Including Postage.
Weekly--52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of Three Dollars by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Postmasters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to
MUNN & CO., 361 Broadway, New York.

Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT, for the United States, Canada, and Mexico, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for $7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check,
MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN BUILDING EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates* and other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Floor Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to
MUNN & CO., 361 Broadway, New York.

Export Edition

of the SCIENTIFIC AMERICAN, with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN is published monthly, and is uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places *throughout the world*. $3.00 a year, postpaid, to any part of the world. Single copies, 25 cents.

☞ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost. Rates upon application.
MUNN & CO., Publishers,
361 Broadway, New York.

PRINTING INKS.
The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York

© 1895 SCIENTIFIC AMERICAN, INC.